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The New German Tariff.

It seems there are many people in Germany who take the same view we have taken regarding the proposed new tariff, and as discussion goes on it is being made plain, we think, that the tariff will benefit the land owners of Germany almost exclusively—*i. e.*, those who live by what other people pay them for the use of that part of the earth's surface as distinguished from those who in some way earn their living. It is being pointed out that the increased cost of foodstuffs will be directly injurious to the industries which Germany has been doing so much to build up, although there is evidence in the schedule of the fine work of certain special manufacturing interests. For instance, we note that sewing machines that are driven by treadle are taxed twice as heavily as those driven by power, which, of course, is designed to throw a special burden upon those who buy machines for use at home—a burden which probably the manufacturers who use power-driven machines would be able to resist the imposition of. Bicycles are taxed at $35.70 per 100 kilograms, or 220.46 pounds. This would make a wheel weighing, say, 25 pounds, pay a duty of about $4. And it is to be noted that the specific duties which seem to have been uniformly adopted—*i. e.*, duties levied up a given weight or quantity regardless of its value make them bear relatively very much heavier upon those who must economize and who feel compelled to get the lowest-priced article that will answer the purpose.

If, however, there is in Germany any general recognition of the phase of the question to which we have called attention—*i. e.*, the difference in the circumstance under which fiscal measures must operate there and in the United States we have failed to note it and we fear that many well-meaning Germans are deceiving themselves on that point. They argue that America has been prosperous and America has a high tariff, ergo Germany must also have a high tariff if she would be prosperous; entirely overlooking the fact that this country has had within its own borders unrestricted trade which has made it and which makes it to-day the greatest free-trade nation on earth with the exception of Great Britain. No single country in Europe even approaches ours in area, in variety of products or productive capacity, and in none probably is there so great a range of difference in wages between the highest and the lowest or such great differences in methods of production. Over this area we have absolutely unrestricted trade, and the only way in which any European country can even remotely approach this condition of freedom and of equipment for competition in the world's markets would be to secure the abolition of all tariffs between the several European countries, which is, of course, practically impossible.

It is our belief, therefore, that Germany by this proposed new tariff is proposing to place fetters upon her industries which, while they will it is true injure certain industries of other countries, such as the bicycle makers and tool builders of America, will hamper and restrict her own industries far more and her people far more generally. Germany will, it is true, buy much less, but in our opinion her sales in other countries will fall off in still greater ratio.

The New York Central Tunnel.

Responsible officials of the New York Central Railroad ought to feel thoroughly ashamed of themselves, in view of the revelations that are being made by official investigation of the condition of the tunnel through which its trains approach and leave the Grand Central Station in New York.

In the first place, so many locomotives pass through the tunnel (about two miles long), and many of the trains are so heavy that the combustion of coal required to do the work, and the exhaust steam make its atmosphere almost unbreathable, and certainly dangerous for those having any lung, throat or heart trouble. The ventilation is very inadequate, and the temperature within passenger cars frequently runs up considerably above 100 degrees Fahr. where it would naturally be cooler than the outside air. Then, to make matters worse, it is found that the fifty men who are employed within the tunnel are provided with no water-closet accommodations whatever, and the excreta from them is allowed to still further pollute the already foul air. Then, as though that were not enough, it is found that at one place the top of a large sewer was removed in laying tracks, and that this is covered only by loosely fitting planks, which allow sewer gas to escape into the tunnel. The ditches at the sides of the track carry water which percolates through the soil, and this water is in many places foul.

For a long time it has been urged that electric locomotives should be substituted for steam ones within this tunnel, or that some other means should be taken to make it more tolerable. But the company's officials have steadily maintained that nothing could be done—that the best engineering and other talent had been and still was employed upon the problem, but that no way of improving conditions could be devised. People are getting thoroughly tired of this, and it now seems likely that the officials will be compelled to do what they have declared was impossible.

The fact is that this road, by its control of the old Harlem Railroad, has the use of the only rail entrance into the borough of Manhattan, New York. It has one of the most valuable monopolies on earth, and from first to last it has used it in a way carefully calculated to get the most possible out of it for the Vanderbilt family, regardless of any other consideration. Whether it be a matter of a tunnel, or of air brakes, or of block signals, or what not, it never has taken a single advance step that we now recall, until compelled to do so, because longer resistance was seen to be futile or absolutely dangerous to the security of its princely monopoly. We are credibly informed that at least one perfectly reliable and responsible electric manufacturing concern has offered to put in a plant for handling these trains by electricity and to give bond for the satisfactory performance of the work. But it did not offer to do it for a dollar, and, in our

opinion, the only reason its offer was not accepted was that more dollars were asked than the road's officials were willing to spend, and they preferred to torture the traveling public a while longer, because that is cheapest.

Outfits for Shop Accidents.

A short time ago we printed a note asking our readers where emergency outfits for shop accidents could be obtained. It brought many replies. While the information had been desired primarily for one person who had asked the question of us, it may not be amiss to publish it for the benefit of others, since every shop where accidents are liable to occur ought to be prepared to meet them. The following is a complete list of the firms cited as able, or whom the writers think are able, to furnish such outfits:

Johnson & Johnson, New Brunswick, N. J.; Adolph Levy Company, 127 East Twenty-third street, New York city; W. V. Willis & Co., 134 South Eleventh street, Philadelphia, Pa.; Convenient Cabinet Company, Dayton, Ohio; Dennison Manufacturing Company, South Framingham, Mass.; Seabury & Johnson, Orange, N. J.; Chas. Lentz & Sons, 18 North Eleventh street, Philadelphia, Pa.

Some of the firms named are, we understand, regular manufacturers and others putters-up of such outfits. We have circulars from the two first mentioned, describing the contents of their cases—such as bandages, plaster and antiseptics. A direction book on first aid to the injured is a most useful part of the equipment. Johnson & Johnson's outfits were mentioned in many of the replies received. The Adolph Levy Company's seem also to be popular. They have equipped the Missouri Pacific and Long Island railroads with complete emergency accident hospital cars and fitted out the Peary, Baldwin-Ziegler and Peary Relief expeditions. They charge $10.00 for their No. 10 case.

Echoes from the Oil Country.

RUNNING THE "OLD" LATHE.

The other day when I went down to the city I called in to see a friend who is foreman of a shop there. I found him in a rather bad humor. Generally he is good natured, and even when things go crosswise, laughs and lets them smooth out. He used to say that a good letting alone cured lots of machine shop ills. It never seemed to bother him much if his best man left. Used to say it did him good, as it gave him a chance to stir up the good in some of those left, to get someone able to fill the place, and sometimes the last man was the better of the two. So I was interested to know how his temper had been stirred to get him into the state I found him in, and it did not take me long to induce him to tell me all about it.

"You see," he said, "I never did anything to prevent a man's leaving, except to try to make this the most profitable place for him to work; and now to have one act the cur, and lay off, pretending to be sick, and go and get another job, and go to work, letting me find out as best I can that he is sick of the place here, and that is all the sickness he has, makes me sick.

"If I tried to hinder their leaving, or did anything to keep them from finding work somewhere else," he went on, "it would be different; but I have always stood ready to help any of my men along, and I have frequently given them a recommendation to others, although it meant losing them to do so; but I think it only right to do that for any man that has acted the man while working here.

"I will tell you one thing, though: I have found out when a man comes looking for a job and I find he is working somewhere else at the time, I don't want him. He is generally just such a fellow as the one that did this trick to me.

"You just think of having to suspect every man who says he is sick, of untruth, or requiring a doctor's certificate before believing there is any sickness.

"After a foreman holds a job several days, hanging up a lot of much needed work, and then finds the man took that way to quit, he is apt to get cranky and put someone into the place of the next man that gets sick, and then find he is really sick."

As this was a matter that might become interesting if our own shop ever got to be of any size, I thought I would try to find out all I could, so I asked him what he generally did when a man came and told him he wanted to quit.

"Do? Why, I generally go to the office and see about his getting his money promptly, wish him success where he is going, and, if he is a really desirable man, I ask him to come around any time he is out of a job.

"You see, the thing that riles me is to think I was dumb enough to hire a man who doe n't know any better than that. He evidently thinks he amounts to so little that it really doesn't make any difference whether he is around or not, and yet, you understand, I didn't see into him far enough to know it."

As our shop is so small, and every man in it a jewel of a different kind from every other, our dealings with our men are on an individual basis, and as any man who has get-up enough to make a good job hand has hard sense enough to know when he is getting a fair price for his work, we have very little trouble with them. Occasionally a chap strikes the shop who knows it all. When we need a man in a hurry we sometimes take on one, knowing it will only be temporarily, that we would not think of for a steady hand.

When Jack struck our shop we were busy. He was an Englishman, young, a really fine workman, not long in America, and with the usual contempt for "us foreigners." The "old" lathe was empty (I suppose it is needless to say that that old lathe was an old lathe that was an old lathe indeed), and I put him on it, telling him to look out a little, as she was a bit worn.

The first job was a piece about 18 inches long with a thread several inches long on one end. This job would take one of the boys about an hour to do. Now, Sammy used to run that lathe, and so, to be sociable like, he went over and tried to explain to the stranger that if he always held the slack back on the cross-carriage, and tipped it up all it would go at the same time, and held back on the hand-wheel a mite, so the carriage could not draw ahead, it was just next to no trouble at all to cut a thread on that lathe.

Of course it was a little awkward to set the cut for depth, but if you just watched the handle and the center punch mark and that little cross and the file mark and those scratches, that was just easy, too. You see, Sammy had a private micrometer on the cross feed on that lathe.

At this point our new friend checked him with: "See here, lad, they had a lathe where I served my time; so I've seen one before; you just keep over beyond, where you belong, and when I need any of your advice I will come for it."

Sammy, taken rather aback at this, and very red in the face, went back to his work whistling a little, soft, screechy air. In about thirty minutes a man was looking for the boss to know where he could get another piece of iron, as the tool had dug into that one and thrown it out of the lathe. In about forty minutes more a man was wanting to know how we did without the "backing strap." Ten minutes after an opinion was wanted as to what sort of a lathe it was that cut every other thread thick. Finally a man came and began an explanation as to the fine lathe he had run and how fine a job it would do, and what a fine workman he was, and how he could do any job on any machine that anyone else could, and that he just wanted to stay long enough to get an opportunity to show that this was all just as he stated it; but that old lathe was really not in shape to do anything on, you know, that he knew all about lathes that he knew, and if I would just give him a decent machine he would just show me what a good workman could do.

Sammy had a plain job in the chuck, so he was given the piece to do in the old lathe, while Jack finished his job. Bless you, that job didn't bother Sammy a bit. He was used to a lathe that had a quarter inch slack in the lead screw bearings and nut, that had all sorts of motion in the cross carriage. Why, he often cut a 11½-inch thread on it, and he used a 70-tooth gear instead of a 69, as that lathe, he believed, was made before there were any 11½ threads cut, and there wasn't any use bothering the boss about any little thing like that. What would be the use?

The boss wasn't loaded up with odd-toothed gears, and if those ⅜-inch tubes that came from England threaded 19 to the inch would hold (and they did) in an 18-thread fitting, what need to worry over a 11½ thread?

Yes, Sammy and that lathe were regular cronies (of course, he liked the new one a little better, as it let him have time to eat apples and throw a nut at that old rat over in the corner, and tear the old pump apart to see how it was made inside, and watch Joe's cut, while he went out after more apples, and to slip out himself and chat with that girl from Cherry-tree while her father was inside seeing about his job) and it never cut up any with him, while he made a piece with a nice even thread on it, and kept the same screechy little tune going.

Jack, as I have said, was a good workman. He also needed work, and it did not take him long to find out that he was seeing the trade under rather different conditions from those he had been accustomed to, so he made friends with Sammy and the rest of the hands. He found that the ability to ask questions was one valuable help to a job hand, and he soon acquired the art to quite an extent.

When lack of work made it necessary for him to go elsewhere, he went with the good wishes of every man in the shop, some of whom often speak of him and wonder what became of him. One thing he had that others have lacked, and that was grit. Sand is a good thing in a shop, if it is in the right place.

W. OSBORNE.

Inquiries for Machinery.

(157) Wanted, name and address of manufacturer of Fluke's patent expansion boring bar.

(158) Manufacturers of machines for labeling round and square tin cans.

Commercial Review.

NEW YORK, Monday, Aug. 26.

STEAM-ENGINE MARKET AND OTHER NOTES.

A spokesman for one of the most influential American companies engaged in steam-engine manufacture gives his opinion that if the market shows more than a normal expansion of business with the fall season there must be an advance in prices. He speaks more particularly for his own company, of course, and it is not true that a change in values is given much thought among the local trade, but the implication of the remark as to industrial activity is fairly well in accord with the experience of the leading engine sellers. In fact, the demand for engines has kept at high tension right through the summer.

One of the largest engine building companies, at its local office, reports business rather quiet, but says that works are so crowded that it has been compelled to a great extent to hold aloof from the contest for orders, and that consequently its observations are not necessarily indicative of general trade.

The steel strike is not yet an important factor of the engine market. There is no reason why it should greatly injure demand so long as it does not spread a panicky feeling throughout other lines of industry. A difficulty in securing engine material, such as shafts, is not overlooked in the trade as an eventuality, but has no practical importance thus far.

A new stationary engine building company is about to be launched, this time at Seneca Falls, N. Y., W. G. Shepard, inventor of the Shepard stationary vertical engine proposes to organize a stock company with $300,000 cash capital, half of which has already been assured. Two-thirds of the capital will be used for erecting and equipping the shops, which are to give employment to 350 skilled mechanics.

The impression may prevail that the orders for machine tools placed for the British Westinghouse works at Manchester included only American makes. It is but fair to say that not only the cranes, as we have before stated, but a portion of the machine tools are to be of English build. Messrs. Alfred Herbert, Ltd., of Coventry, have received an extensive order for their No. 6 hexagon turret lathes to go to the new plant. These lathes are stated by the makers to be the most expensive in the market. The cornerstone of the British Westinghouse works was laid August 3, the Lord Mayor and Sheriffs of London participating in the ceremony. Business in England is now very slack, and is expected to remain so until the middle or end of October.

The stockholders of the Fifield Tool Company of Lowell, Mass., held a meeting, August 5, at which meeting it was voted not to rebuild the works recently destroyed by fire and to settle the affairs of the company as soon as possible and discontinue business. This apparently ends the career of a concern which has been prominent in the lathe market and which has done a very large business.

One of the current examples of machine shop construction is that of the Pennsylvania Iron Works, of Reading, Pa., who are about to replace their old wooden machine shop with a steel and brick structure 284x90 feet. For this purpose the capital stock of the company is to be increased from $150,000 to $225,000. Since the demolition of the old building was scheduled to begin last week it is likely that such new equipment as may be required will be ordered very shortly.

The Cambria Steel Company is about to take up the manufacture of steel cars on a large scale and will build works for this purpose at Franklin, a suburb of Johnstown, Pa. The main building is to be 160x800 feet. The plant will employ 2,500 men and have a capacity of 40 cars a day. It is said that the company has already booked orders for thousands of cars from such railroads as the Pennsylvania, Philadelphia & Reading, and Baltimore & Ohio.

Improvements of a marked character continue at the Dodge Manufacturing Company's plant, Mishawaka, Ind. It is said that company's machine department is flooded with work and that a night force will again be put on.

The Sprague Electric Company has been obliged to run the New York factory at night for some time to meet the demand for its flexible conduits for interior wiring.

The Ball-Bearing Company, Boston, Mass., is so rushed with orders that it started last week to run nights.

JAPAN AND THE PHILIPPINES.

Okura & Co., contractors to the Japanese Government, whose head offices are in Tokio, with branches in many Japanese towns, also at Melbourne and London, have opened a New York office in the Bowling Green Building with a view to the purchase of American material, etc. The local office is under the management of M. Yamada. The Okura concern handles principally railroad material and is also interested in electrical machinery, firearms and explosives, leather manufacturing, forestry, mining, etc. Mr. Yamada states that he will be glad to have catalogs, prices, etc., of American manufacturers turning out goods in these lines. His people are in the market for tanning material for leather. He is also purchasing steam hammers and various small machine tools for installation in the Japanese arsenals, the Bradley Co., of Syracuse, N.Y., having received an order for the former. There are some large railroad projects being taken up by the Imperial Government for roads in the main island; also railway schemes are projected by the governments of Formosa and Hokkaido. It is understood, however, that financial conditions in Japan cause a temporary delay in some of this work.

The Atlantic, Gulf & Pacific Company, whose local offices are in the Park Row Building, and which has been allotted the contract for the Manila Harbor improvements, is at present placing contracts relating to same, the amount of which is stated to be about $1,950,000. Some $130,000 goes for hydraulic dredges, the component parts of which dredges will be turned out by various plants throughout the country. Six hoisting engines have been ordered from the Lidgerwood Manufacturing Company, of Brooklyn, and a pneumatic tool outfit for scow building, rivet work and hull construction from the Standard Pneumatic Tool Company. Among other equipment which will be or has been ordered is an air compressor, a derrick plant for quarry work, rock drills and four boilers of 150 horse-power each.

A comparative statement of the commerce of the Philippine Islands for

the seven months ended January, 1901, and 1900, has been prepared in the Division of Insular Affairs of the War Department. The total value of merchandise imported during the seven months ended January 31, 1901, was $17,999,167, as against $12,674,705 for the same period of 1900; and the total value exported was $12,637,359, as against $8,305,530 for the same period of 1900, an increase of 42 per cent. in the value of imports and of 52 per cent. in the value of exports. The value of imports of merchandise from the United States for the seven months was: 1901, $1,493,488; 1900, $890,010, an increase of $603,478, or 68 per cent. European countries, 1901, $8,974,183; 1900, $5,270,766, an increase of $3,703,417, or 70 per cent. The figures as to imports are exclusive of Quartermaster's supplies. The value of exports of merchandise to the countries mentioned during the seven months was as follows: United States, 1901, $1,477,611; 1900, $2,037,630; European countries, 1901 $7,983,751, 1900 $3,201,658. The value of iron and steel and other metals and manufactures thereof imported in the seven months ending Jan. 31, 1901, was: $1,204,149, an increase of $760,519; steam and sailing vessels, $552,985; machinery, machines and vehicles, $294,943, an increase of $197,176.

In spite of the disturbances in North China last year the foreign trade of China for 1900 amounted to 211,070,432 Haikwan taels, which, although not equal to the high figure of the previous year, was slightly greater than the sum for 1898. The excellence of this showing is to be attributed to the brisk trade prevailing during the first part of the year and to the absence of such a commercial panic following the war as might reasonably have been anticipated.

GERMAN AND CONTINENTAL AFFAIRS.

The continental scare over American competition has reached an acute stage to judge from statements of returning European travelers—specifically of Senator Depew and ex-Senator Washburn of Minnesota, who have simultaneously come out with deliverances on the subject. The trusts refuse to sell anything to a merchant who deals in an imported article, says the former, and in Vienna, when an American shoe dealer opened his own warehouse, the native shoemakers mobbed the place while the police looked the other way. A writer on German affairs in a current magazine shows how the desire for an anti-American commercial alliance has inspired an attempt to conciliate the French so as to enlist them in the movement. A statistical history of the wars between Germany and France has been brought out which strikes a nearly even balance between the numbers of battles won and of men lost on the two sides, showing that upon the whole there is no cause for either side to harbor grievances. There are some strong opinions, however, that an anti-American alliance of the character proposed will be impracticable, and the English "Outlook" says that at any rate Great Britain would be no party to the bond.

The imports of machinery to Germany dropped from 81,607 tons during the first half of 1900 to 63,381 tons for the same period this year, a loss of 22.3 per cent., which is rather less than might have been expected, in view of the almost total suspension of factory construction. Among machinery imported from the United States there were 15,078.7 metric tons of agricultural machines, and it is worthy of note that the entire import from all countries was only 19,410.8 tons, so that more than three-fourths of the whole supply came from the United States. Among other countries Great Britain leads, with an export to Germany in this line of 2,560 tons.

CHICAGO MACHINERY MARKET.

In the engine and boiler trade there is not quite the excellent demand which existed a month ago and two months ago. Indications are that the first half of the year has made a record which will be above that of the second half. Present trade is not dull; it is in fact quite active, but that for the first six months was phenomenal in the aggregate. For the slow decline towards a normal condition of the market the current steel strike is generally pilloried as the main cause. Manufacturers of power machinery who have a number of "jobs" in progress say that all sorts of delays are occurring, many of which are not to be attributed to the strikes. There are delays of construction arising from a scarcity of brick masons and delays occasioned by a scarcity of brick. There is backwardness in deliveries of beams and other structural shapes, which cannot be attributed directly to the strike, for the structural mills are not involved. But when it comes to pipe and tubes, the area of legitimate strike depression is entered and of gas and other pipe there is short supply. The slowness of building operations is delaying the installation of power and there are enterprises which have been postponed because of the above adverse conditions. The slackening of activity may be timely, for makers of engines and boilers generally report a most satisfactory state of affairs at works in respect to orders booked. They are usually running overtime and are backward in making shipments. The large business secured earlier in the year has not been finished. Current business runs largely to medium sized installations for manufacturing plants.

The oversold condition of makers keeps the market for large second-hand engines active. Wickes Bros. have recently sold to the Chicago Edison Company two second-hand 40x72-inch Corliss engines of about 1,600 horse-power each for temporary use until new engines previously bought can be delivered, and a pair of 28x60-inch second-hand Corliss engines to the Illinois Central Railroad Company for elevator work.

The Chicago business of the Babcock & Wilcox Company for 1901 to date has been above the average twelve months trade in the past seven years. It exceeds the business of the first eight months of 1900.

Among orders recently booked by the Heine Safety Boiler Company are the following: Three boilers of 100 horse-power each for the Colorado Fuel and Iron Company, Denver, Colo.; one of 200 horse-power for the Irondale Lead Company, Irondale, Mo.; four of 250 horse-power each for the St. Louis & Belleville Suburban Railway, Belleville, Ill.; one of 120 horse-power for the Anaconda Copper Company, Anaconda, Mont.; two of 100 horse-power each for the Imperial Gold Mining and Milling Company, Deadwood, S. D.; one of 400 horse-power for the City Lighting Company, St. Louis, Mo.

Filer & Stowell Company has sold a Corliss engine of over 2,000 horse-power to the National Wire Corporation, New Haven, Conn., and among Western orders a direct-connected 18x36-inch Corliss of 300 horse-power to the J. K. Farley Manufacturing Company, Chicago.

Quotations.

NEW YORK, Monday, Aug. 26.

Pennyslvania Foundry Pig Irons, Jersey City delivery:

No. 1 X	$15 15 @ $16 00
No. 2 X	14 65 @ 15 15
No. 2 plain	13 75 @ 14 25
Gray forge	13 00 @ 13 75

Alabama Pig, New York delivery:

No. 1 foundry, or soft	15 00 @ 15 25
No. 2 foundry, or soft	14 25 @ 14 50
No. 3 foundry	13 75 @ 14 00
Foundry forge, or No. 4	13 25 @ 13 50

Bar Iron—Base sizes—Refined brands, mill prices on dock, 1.58c.; from store, 1.85 @ 1.90c. There is a report, however, that the bar iron manufacturers' association has advanced prices to the basis of 1.63c. on dock.

Tool Steel—Base sizes—Good standard quality, 7c.; extra grades, 10c. and upward.

Machinery Steel—Base sizes—2.00c. from store.

Cold Rolled Steel Shafting—Base sizes—From store, 2½ @ 2¾c.

Copper—Lake Superior ingot, 16½ @ 16¾c.; electrolytic, about 16⅜c.; casting, 15¾ @ 16c.

Pig Tin—26¼ @ 26½c. spot for 5 and 10-ton lots, f. o. b.

Pig Lead—For wholesale lots, 4⅜c., with .02½ @ .05c. extra for carloads.

Spelter—4.00c., New York.

Antimony—Cookson's, 10⅜ @ 10½c.; Hallett's, 8½c.; Hungarian or Italian, 8¼ @ 8⅜c.

Lard Oil—Prime City, 68 @ 70c. for jobbing lots.

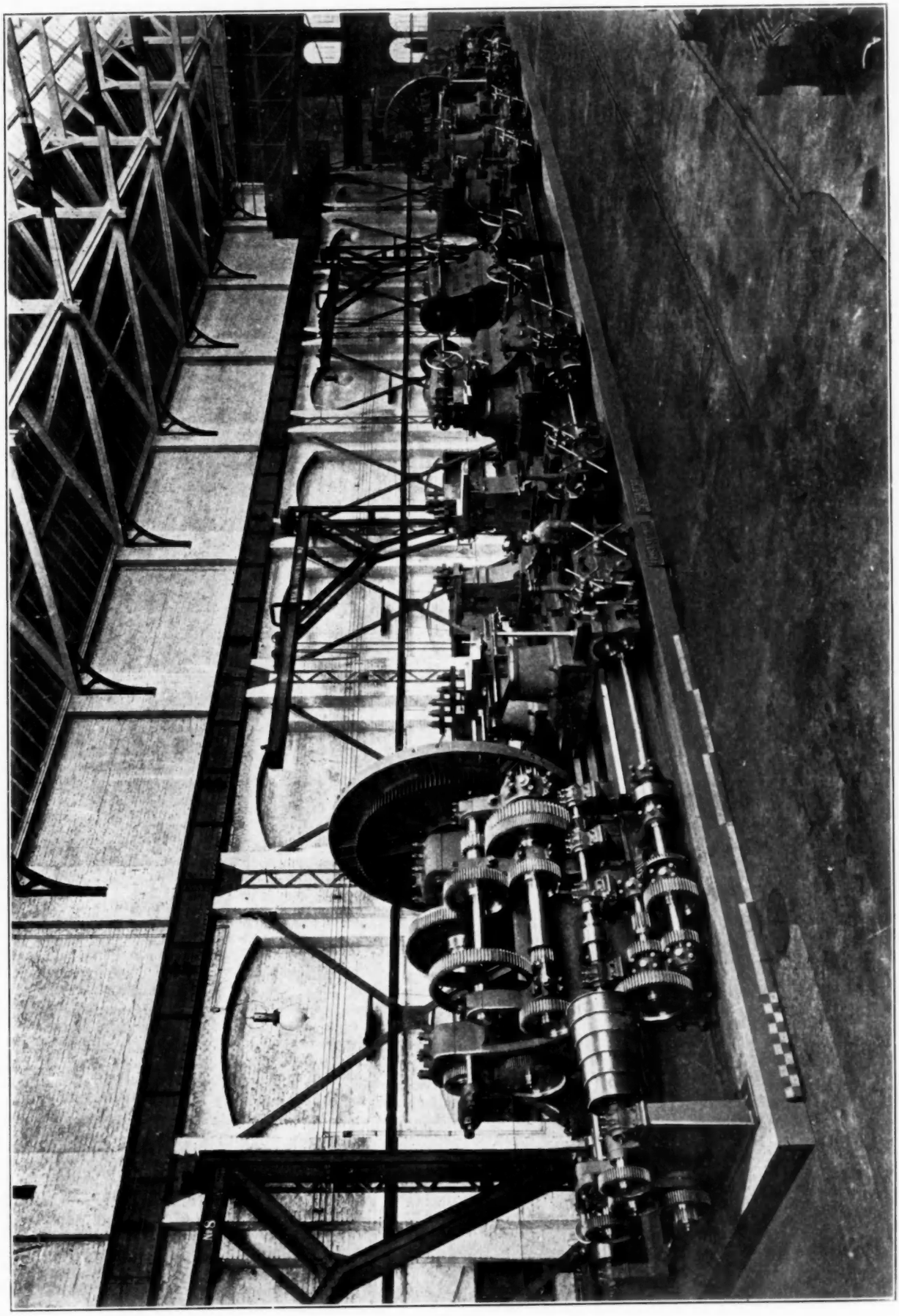


FIG. 1. MARINE CRANK-SHAFT LATHE BY ERNST SCHIESS, DUSSELDORF, GERMANY.

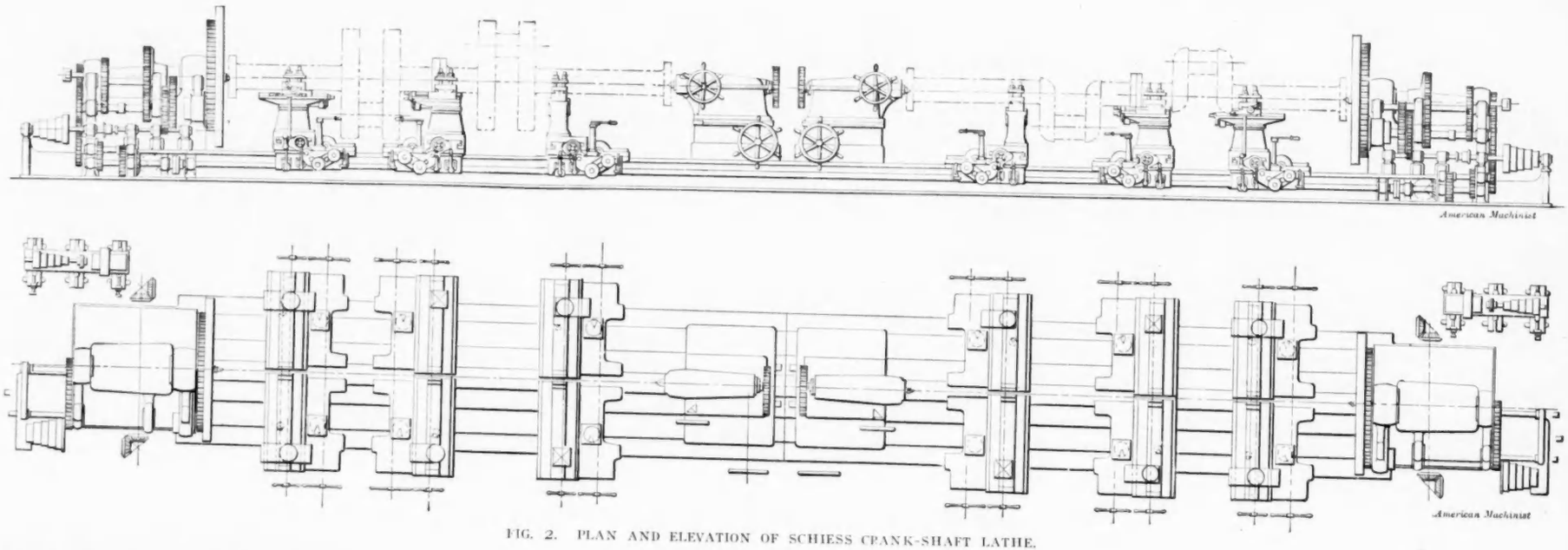


FIG. 2. PLAN AND ELEVATION OF SCHIESS CRANK-SHAFT LATHE.

A Large German Crank Shaft Lathe

The accompanying half-tone and line engravings illustrate a superb piece of tool making—the largest lathe, it is believed, when swing and length are both considered, that has been made. The swing of the lathe is 3,600 millimeters (11 feet 8 inches) and the extreme length between centers when the right-hand footstock is removed and the other is slid down to the right-hand headstock is 24,000 millimeters (78 feet 7 inches), while the extreme length of the bed is 34,900 millimeters (114 feet 6 inches).

The bed will be seen to consist of four webs and guideways, each pair of webs carrying six tool-posts. The extreme width of the bed is 3,600 millimeters (11 feet 8 inches), while its depth is 700 millimeters (2 feet 3½ inches). The lathe is double-ended throughout, having two headstocks and two footstocks. It is to be driven by two 50 horse-power electric motors through five step cone pulleys, and has several combinations of back gears through the spindle and through the geared face-plate, these combinations giving speeds between ¼ and 48½ revolutions per minute.

The diameter of the front spindle bearings is 500 millimeters (19 11-16 inches), the length being 730 millimeters (28¾ inches). The face-plates are 3,500 millimeters (11 feet 6 inches) in diameter and are fitted with steel chuck jaws. A friction clutch is provided in each headstock by which the machine may be stopped instantly.

The fitting of the tool-posts to the carriages will be seen to be by right angle gibbed surfaces. There are twelve rests in all and they are of three patterns. The one near which the workman is standing has a supplementary swivel slide at the top which may be used for short work or for turning tapers. The feed of the upper slide is automatic. The next rest to the right has no swivel and is narrow to permit its use in facing crank checks. The third rest is a compound rest. The farther end of the lathe and its rear side have similar arrangements of rests. The columns on which the rests are mounted are secured to the slide blocks on the carriages by T-slots and bolts and are made to interchange among themselves so that any pattern of rest may be used on any carriage. The upper parts of the rests are of steel. They are entirely independent of one another.

The longitudinal feed has a range of from .8 to 5 millimeters (1-32 to 3-16 inch). Quick power traverse of the rests is also provided. The manipulation of the feeds, reversing, etc., are all accomplished through handles which are placed on the carriages. The feed traverse is by splined rods and racks, and within the bed are two lead screws for screw cutting. All feed and driving gears of the carriages as well as the racks are of steel. All worm wheels as well as the spindle bearings are of phosphor bronze.

The footstocks are very massive and have a very convenient arrangement for manipulating the dead spindles, which are 240 millimeters (9½ inches) diameter. The traverse of the footstocks is by pilot wheels. To facilitate the movement antifriction rolls with eccentric adjustment are provided.

The lathe is intended to take the heaviest marine crank shafts in their assembled condition and weighing up to 60,000 kilos (132,000 pounds). The gross weight of the lathe is 400,000 kilos (882,000 pounds). It is the product of the works of Ernst Schiess, of Dusseldorf, Oberbilk, Germany.

A few comparisons between this lathe and the great Pond gun lathe at the Watervliet Arsenal, which was illustrated at length in our issue for April 2, 1896, may be of interest, although no close comparison is possible because of the different purposes for which the tools were designed. Thus the Pond lathe is single ended and has but one headstock and one footstock and but two carriages, and the weight is

of course reduced by the omission of these parts. The extreme length of work for which it was designed (16-inch guns) is but 50 feet, but as boring the guns is a part of the functions of the lathe, the length of the bed was nearly doubled by the support for the boring bar. With these explanations we give a few leading facts regarding the Pond lathe: Extreme length, 138 feet; gross weight, 560,000 pounds; diameter of face-plate, 9 feet 2 inches; front bearing of main spindle, 24 inches diameter by 2 feet 7¾ inches long; weight of gun intended to handle, 284,000 pounds.

William Sellers & Co. have, we believe, recently made one or more single-ended lathes to swing 12 feet in diameter, but of much less length than the one described.

Photographing Machinery.

Many things often conspire to make the photographing of machinery a matter of difficulty. Among these are the subject itself, its situation and the urgency of the work. I will take these and other points in order, and hope to give some practical hints, which will, of course, have been arrived at by the man who has had much experience in this work, but may save the beginner—amateur or professional—from many failures.

A machine or engine ought to be photographed when it has received the coating of "gray filling," which precedes the final paint. This gives a matt surface of a neutral or bluish-gray, and saves no end of annoyance in the matter of reflections which frequently appear in the varnished surface. If the machine in this state is not available, something can be done by dabbing over the painted parts with putty. Care should be taken, too, in arranging the machine away from objects which can form reflections in its polished surface. Unfortunately, it usually happens that it must be taken where it is or not at all; but even in this case it is often possible to rig up dark screens around it.

Bright steel parts should always be painted. Some prefer a species of whitewash, which is rubbed off afterwards with a cloth. Better is a mixture of white lead and turpentine (of the consistency of thin cream), enough lamp-black being added to dull the brilliancy of the white, and then one-third (in bulk) of gold size to give adhesion to the mixture. After use, a rag dipped in turpentine removes the coating.

Now as to lighting. This, unfortunately again, has generally to be made the best of. We must aim at a rather low front lighting. Top light, owing to its casting heavy shadows, is bad; details are hidden in underlying parts of the machine, and detail, microscopically sharp, is what is wanted in negatives of these subjects. The engineer wants every nut and bolt to show. Therefore the tendency—of both indoor and outdoor lighting—to give too much top light must be counteracted. Much good can be done with reflectors. A white sheet, wood covered with tinfoil, or, for large subjects out of doors, sawdust or white sand strewn on the ground around the machine, are some of many efficient means.

Artificial light also is useful. A thin line of flash powder laid near, around the subject, but not so near as to come into the field of view, is a help that can be adjusted to any extent.

Some few details connected with taking the picture fall to be mentioned. It is often well to lower the camera within a few inches of the ground, thus getting details in the lower shadowed portions. Lettering is sometimes a difficulty. Letters cast in intaglio on the machine may, if not plain enough, be filled up with a paste of whiting and water. The prominence thus given to the firm's name is a point which they will appreciate.

As regards background, it is hopeless, I am afraid, to expect to get such a white and even background that no blocking-out need be done on the negative. But it is sometimes an advantage to reduce as far as possible the marks and dirt sure to be found on any background extemporized in engineering works. To do this, keep the background gently moving during exposure. Some object should figure in the print whereby an idea may be obtained of the size of the machine—say, a 1-foot rule in the case of small machines, and a man (who, by the way, should be engaged in looking after the machine, and not in staring at the camera) in the case of larger engines.

Exposure, it need not be said, should be full, and development commenced with a weak solution to get detail everywhere, and just enough density obtained afterwards to give a plucky print. Too great density makes blocking-out more difficult. In any case, this is—except to the draftsman—the worst part of the process, but it is absolutely essential for commercial purposes, such as catalog illustration, etc. To become expert is simply a matter of practice; but here are one or two hints: Avoid touching the film before blocking-out, for any patches of grease from the fingers make it almost impossible to outline neatly with brush and pencil. Use Indian ink—ground by yourself to an absolutely dense black fluid, free from brownness when viewed in the dish—for the outline, and fill in larger areas with a good mixture like Photopake. Place the negative on a retouching desk, with a mirror below to give a strong illumination through the negative. At night an incandescent electric lamp fixed to a stand which can be moved about under the negative is quite the best thing. Rule straight lines, such as the top of a boiler, with the drawing pen, and go round other parts with a long "duck" sable-hair pencil well charged with color. A steady and confident hand is a *sine qua non*—if you feel at all shaky or nervous, better leave this part of the business alone.—"Photogram."

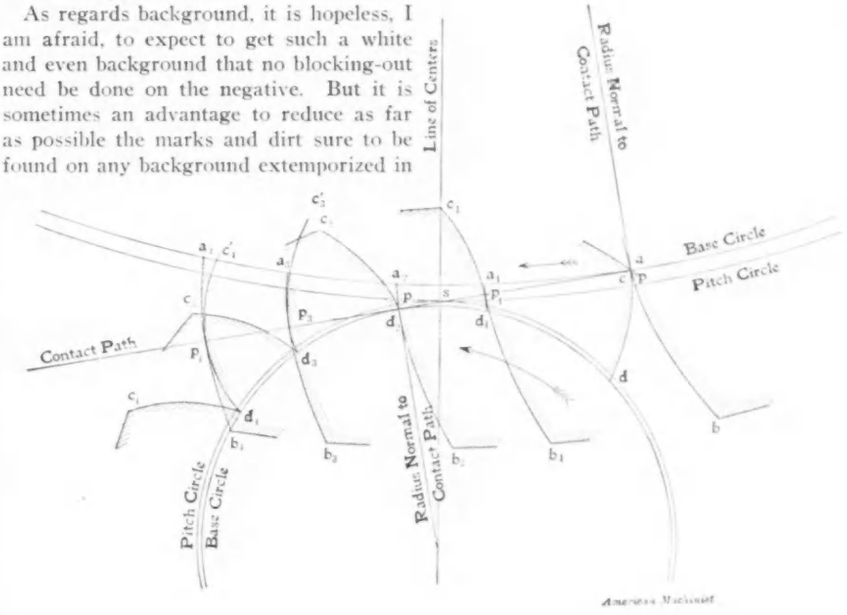


FIG. 1. EXAGGERATED ILLUSTRATION OF INTERFERENCE.

The Effect of the Angle of Obliquity in Fixing the Interference Limits for Involute Teeth.

BY ROBERT A. BRUCE.

The fact that interference can be altogether avoided in involute gearing by sufficiently increasing the angle of obliquity is known to most mechanics. Precisely where the limit is reached for a given angle of obliquity is easily calculated for interchangeable gearing. The following extension of the theory to cover the case of special pairs of wheels may also be useful.

Interference between involute teeth will always occur if the proportions adopted are such as to cause the path of contact of such teeth to be continued beyond the points where the line of contact touches the base circles. This fact is illustrated in a purposely exaggerated manner in Fig. 1. The line $p\,p_4$ touches the two base circles at p and p_2, and a point p traveling along this line, and occupying the suc-

cessive positions p—p_4, would trace involute curves on surfaces carried round with the base circles, which must be supposed to rotate with a circumferential speed equal to the linear velocity of p. Portions of these involute curves are suitable for the tooth profiles of wheels, the pitch circles of which pass through s, the point of intersection of the path of the point p and the line of centers. As long as p remains between p and p_2, ordinary contact as in involute gearing takes place, but when p travels beyond and to the left of p_2 a new branch of the curve is traced out by the moving point on the surface carried by the smaller base circle.

Mathematical contact takes place as before at p_3 and p_4, which are points of contact of involute curves of the two base circles, but the involute of the lower base circle is now internal to the involute of the upper base circle. In other words, physical contact is no longer possible between the same surfaces as before, which were convex to each other before the point p_2 was reached. The surfaces $a\,b$ and $c\,d$, shown at $a_1\,b_1$ and $c_1\,d_1$, and again at $a_2\,b_2$ and $c_2\,d_2$, touch each other externally, but at $a_3\,b_3$ and $c_3\,d_3$ and again at $a_4\,b_4$ and $c_4\,d_4$ interpenetration of the surfaces formerly in contact takes place. It is therefore an easy matter to lay down the conditions under which interference becomes possible.

For, let the base circles $m\,e$ and $n\,k$, the pitch circles $p\,b$ and $p\,a$ and the line of contact or obliquity $m\,p\,n$ be drawn for a pair of wheels which are required to gear together, as in Fig. 2; then if circles $m\,t$ and $n\,s$ are drawn through m and n, the working portions of the involute profiles must not extend beyond them, and they may be termed "limit lines." The "limit lines," in fact, represent the greatest possible addendum circles for the wheels in question, if interference is to be avoided. Moreover, if, as is usually the case, it is desired that the addendum of each wheel shall be equal, it is evident that the greatest value for the hight of the tooth beyond the pitch line must be determined by the "limit" line through m. Join A and m by a line cutting the pitch circle of the larger wheel at f, then $f\,m$ is the limiting value of the addendum of the pair of wheels in question. Now, $A\,f$ is the radius of the larger wheel, and hence if $A\,m$ can be expressed in terms of the dimensions of the wheels and the angle of obliquity, the relation so found will enable us to find an expression for (1) the maximum addendum to avoid interference, for a pair of wheels having a given number of teeth and of a given obliquity; (2) or, conversely, the least number of teeth in wheels of a given velocity ratio and having addenda bearing a fixed ratio to their pitch. The problem of greatest interest is to find the limiting number of teeth in the smaller wheel of a pair, for various values of the angle of obliquity and the velocity ratio.

Let

n = the number of teeth in the smaller wheel,

N = the number of teeth in the larger wheel,

$r = \frac{N}{n}$ = velocity ratio of the gearing.

i = the angle of obliquity,

D = the diametral pitch.

Then, with the usual proportions, the pitch radius of the larger wheel $= \frac{N}{2D} = \frac{r\,n}{2D}$ and the pitch radius of the smaller wheel $= \frac{n}{2D}$, and the addendum $f\,m = \frac{1}{D}$ = the diameter pitch.

We have therefore the following values for the three sides of the triangle $A\,m\,B$ in Fig. 2:

$$A\,m = A\,f + f\,m = \frac{r\,n}{2D} + \frac{1}{D} = \frac{1}{2D}(r\,n + 2) \qquad (1)$$

$$B\,m = B\,p \cos.\, i = \frac{n}{2D} \cos.\, i = \frac{1}{2D}\, n \cos.\, i \qquad (2)$$

$$A\,B = B\,p + A\,p = \frac{n}{2D} + \frac{r\,n}{2D} = \frac{1}{2D}\, n\,(r+1) \qquad (3)$$

In relations between the sides and angles of the triangles we may therefore get rid of the common factor $\frac{1}{2D}$ and simply deal with the triangle whose sides are proportioned, as shown in Fig. 3. Expressing the side $A\,m$ in terms of the other two sides and the angle included between them, a relation is obtained giving the smallest value for n when r and i are given. This relation is:

$$(r\,n+2)^2 = (n \cos.\, i)^2 + n^2\,(r+1)^2 - 2\,n^2\,(r+1) \cos.^2 i \qquad (4)$$

which, after a few transformations, gives as the limiting value for n the expression:

$$n = \frac{2}{\sqrt{(2r+1)\sin.^2 i + r^2} - r} \qquad (5)$$

The curves of Fig. 4 have been drawn by assuming certain values of r and then solving the expression for the value of n for several values of i. Inspection of the curves in Fig. 4 will at once show that

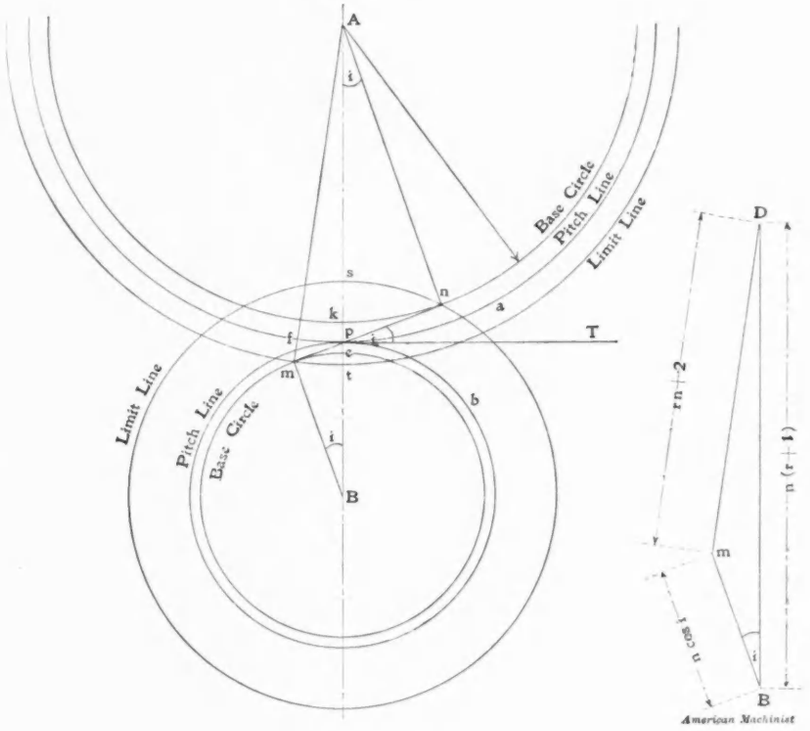
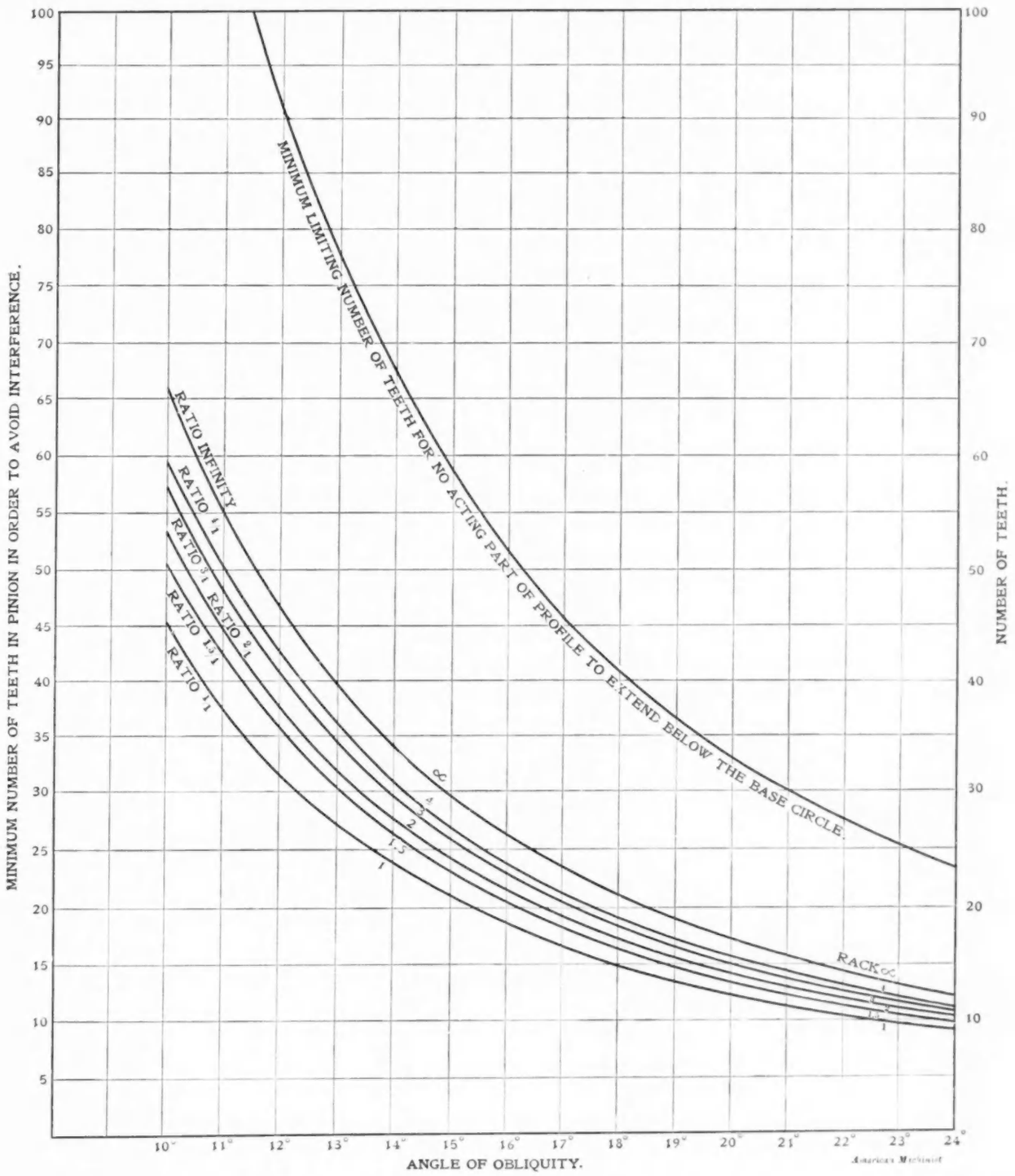


FIG. 2. LIMIT LINES FOR A GIVEN PAIR OF WHEELS.

FIG. 3. TRIANGLE TO BE CONSIDERED.

the larger the value of r, the ratio of the wheels, the greater becomes the limiting number at which interference occurs. The question may therefore be asked, what happens when r becomes infinitely great, that is, what happens in the case of a rack? By applying the method of indeterminate forms to (5) the case where r becomes infinite may be at once reduced to a simple formula. It is more interesting, however, to show how this may be obtained directly. Referring to Fig. 5, $r\,p$ the pitch line of a rack and $p\,s$ that of a pinion are shown in contact at p, through which $A\,p$, a line passing through the center of the pinion, is drawn. Through p, the pitch point, draw $m\,p$, representing the line of contact, making with $p\,r$ the angle of obliquity i, and draw the base circle to touch it at m. Draw $m\,A$ per-



Interference occurs with teeth of ordinary proportion (hight of tooth above pitch line = .3183 × circular pitch = $\frac{1}{\text{pitch number}}$) if the number of teeth in the pinion is less than a certain number found as follows: Find the angle of obliquity on the lower scale, trace vertically to the curve indicating the nearest velocity ratio or an intermediate point determined by estimation, and thence horizontally to the left-hand scale of numbers. When the number of teeth of a wheel exceeds a number found by tracing vertically to the upper curve and thence horizontally to the left-hand scale, the point of the tooth of a wheel in gear with it does not enter at any time within the base circle.

FIG. 4. DIAGRAM SHOWING THE RELATION BETWEEN THE ANGLE OF OBLIQUITY AND THE INTERFERENCE OF INVOLUTE TEETH.

pendicular to $m\,p$ through A, and $m\,n$ perpendicular to $A\,p$. Then the addendum of the teeth is evidently limited by the line $m\,n$, in order that contact may cease at a point m.

Hence the limiting value of the addendum is $p\,n = m\,p \sin.\ i$

$$= (p\,A \sin.\ i) \sin.\ i.$$

But if the teeth are of ordinary proportions $p\,n = \frac{1}{D}$ and $p\,A =$ pinion radius $= \frac{n}{2\,D}$ where $D =$ diametral pitch.

Hence $$\frac{1}{D} = \frac{n}{2\,D} \sin.^2 i$$

$$n = \frac{2}{\sin.^2 i} \qquad (6)$$

And since any wheel of an interchangeable set may be required to work with a rack, we may asign this as the limiting number of teeth in the wheels of a set capable of working without interference. Thus, in the case where the obliquity is made as large as 22½ degrees, which ap-

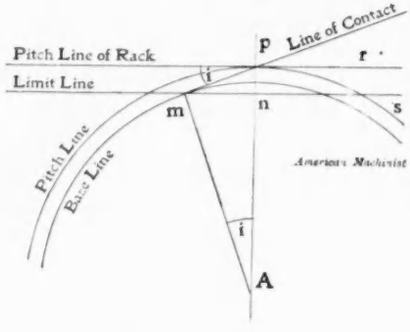


FIG. 5. LIMIT LINES FOR RACK AND PINION.

parently gives satisfaction wherever it has been adopted, interference is not felt till the number of teeth becomes equal to or less than 13, in which case the mating wheel must have more than 87 teeth before correction for interference becomes necessary. For from (5) we can write

$$13 = \frac{2}{\sqrt{(2\,r + 1) \sin.^2 22\tfrac{1}{2} + r^2} - r}$$

which gives $r = 7.26$ or $r\,n = 87.12$.

Even with pinions of twelve teeth capable of gearing with a rack the amount of correction necessary is very slight and does not very materially weaken the tooth.

New Brompton, England.

Industries of the Rhine Country.

John Richards, of San Francisco, has recently returned from one of his many trips to Europe, and as usual while there exercised his remarkable talent for observation. We find in the "Journal of the Association of Engineering Societies" for July a very interesting paper by him read before the Technical Society of the Pacific Coast, entitled, "Notes on the Industries of the Upper Rhine," from which we abstract a few passages:

"Reverting again to some of the industries of the upper Rhine country, Mannheim has become a very great center of industry, because of its being at the head of navigation on the Rhine and because various industries have been founded there by citizens of other countries in order to escape the German tariff, on a method that we know something of in this country. Take the case of Messrs. Sulzer Bros., of Winterthur, Switzerland, as an example. They are extensive makers of steam engines of a very high class, and now employ about 4,500 men. The German tariff, like all others, does not tax workmen or skill, and as soon as this customs law went into effect Sulzer Bros. sent men, tools, drawings and other equipment to Germany to make engines there, the "tariff" remaining in Winterthur, the same as much of our and the French customs taxes find their way to London. I visited these works of Sulzer Bros. at Mannheim, and I can bear testimony to the very high quality of the work done there, where about 1,200 men are employed by the firm.

"Mannheim and Ludwigshafen form practically one city, being on opposite sides of the Rhine, connected by a wonderful bridge, as are all Rhine bridges, especially those at Coblentz, Mayence and Cologne. In Mannheim and Ludwigshafen there is, to use a common phrase, a forest of chimneys, and the chimneys are not a disfigurement, but the contrary. To a visitor from this country there is indeed nothing that is more striking than the industrial chimneys in Germany, Belgium and Switzerland. They are not square, with various degrees of taper and form, but always round, symmetrical, from 200 to 300 feet high, all of harmonious design, with elegant coping, entablatures and commonly are iron-bound at spaces of 15 to 20 feet.

"I am of the opinion that the skill attained in Germany, especially in manipulative processes, now acknowledged to be among the most advanced, has been to a great extent an 'overflow' from the adjoining cantons in Switzerland. There is, indeed, no question of this, and there is the problem; and it is one of some intricacy, how the Swiss have attained so much skill in a country without coal or iron and remote from the great lines of traffic. I gave to this subject such observation as was possible in the short time at command, and consulted engineers and owners at Zürich, Oerlikon, Baden and Wintherthur, where are situated four leading machine industries—namely, Sulzer Bros., Brown, Bouveri & Co., Escher, Wyss & Co. and the Oerlikon Company, employing together about 12,000 men, all engaged on the finer classes of machine work.

"Judged by the skill in evidence, the appearance of the workmen and of the works with the harmonious relations that exist between the employers and the employed, and by a tolerably careful inspection of processes, I am inclined to believe that in no part of the world has skilled industry of this class been so well and thoroughly developed. Among the reasons for this, such as I could discover, are: (1) A complete system of education, secular and technical; (2) a strong predisposition of the people to mechanical pursuits, engendered no doubt by a struggle for comfortable existence where the areas capable of cultivation are limited and the climate unfavorable; (3) the existence all over the country of water power from numerous streams that descend toward the Rhine and lower-lying plains; (4) and especially the fact that the enhanced price of fuel and iron forces the Swiss engineers to a higher class of work, in which skill is the principal component.

"This last reason was given to me uniformly by a number of people who were consulted, and is no doubt the true cause of a very high development of skill in that country. No cheap work of any kind is made, and none in which skill is not a very considerable factor, if not the chief one.

"Coupled with this high development of skilled industry in Switzerland, which I believe is not overestimated, are some facts of much interest to Americans. In Belgium, Holland and German one hears but little of America, but as soon as Switzerland is entered the whole changes. The English tongue comes into use again; one may with confidence assume that all the owners, engineers and managers not only speak English, but have been in America. I found myself in many cases corrected respecting firms and industries in the Eastern States. In the four great works I have named, nearly everyone I met or conversed with had been in America, and in many cases to work here and learn our methods.

"Mr. Henry Sulzer, who is head of the firm of that title, has three sons to inherit and conduct the business; one of them now in principal charge, and all of them well acquainted with American engineering practice. Carl Sulzer, the eldest son, could converse with me in excellent English concerning the various shops in this city, of the Yosemite Valley, Mount Shasta, Mount Tamalpais; indeed, had traveled from Puget Sound to San Diego and examined most things on this coast worthy of noting. I had the honor to be entertained at the house of Mr. Henry Sulzer, where there was a company of nine, four of whom were ladies, and all were able to speak in English and knew more or less of America. While I was in Switzerland another son of Mr. Sulzer was in this city on his way to Japan, where the firm has an agent and does a considerable business.

"At the Oerlikon Works I was conducted through by the manager, who had been eleven years with General Electric Company in this and other countries. At Escher, Wyss & Co.'s works my conductor was a son of the general manager, and,

although quite a young man, had been all over this country. At Basel, Switzerland, I called on the veteran engineer, Mr. Charles Brown, now retired from active service. He was for thirty years with the firm of Sulzer Bros., chief engineer there for most of that time. He will leave behind him a monument of successful work as great, if not greater than any other man of whom I have knowledge. In speaking with Mr. Henry Sulzer, of the great works at Winterthur, he said: 'Many men have had a part in building up these works. Mr. Brown has done a great part of it. We had less than 100 men when he came in 1856.' I also visited Brown, Bouveri & Co., who employ about 2,000 men on electrical work pertaining to power transmission, and who are now putting down a large plant at Magdeburg, Germany, for the manufacture of the Parsons steam turbine. The capital of this company is to be about $5,000,000.

"I had been informed that there was wear upon the vanes of these engines, but Mr. Charles Brown, Sr., said this was a mistake, and that no appreciable wear had appeared in any case. I had also been informed that the De Laval steam turbines had not been successful above 100 or 200 horse-power. This also was a mistake, because the Oerlikon Company is erecting a new plant for this manufacture and has contracts now made for engines of large size; I think of several thousand horse-power, and none of less than 500 horse-power are to be furnished. The large-unit idea is now a ruling feature there in electrical generating plants. There are now in course of construction in Sulzer Bros.' Works at Winterthur single engines of 5,000 horse-power for a central plant in St. Petersburg, Russia.

"What most of all attracted my attention in the Swiss works was the iron castings. They were perfect; not the slightest fault on any face, and their outline at least as true as the patterns. In the foundry processes, I could discover nothing peculiar except convenience, room, order, fine tackle for handling and a means of drying molds by hot air that I had not seen elsewhere. When a mold is completed, a light furnace is set on top, and a current of air is forced through this furnace down into the mold, permeating it and removing the moisture from every part, also heating the mold before it is poured.

"All duplicate work is done on molding machines, but, as Mr. Sulzer informed me, not to the extent that such machines are employed in the foundry of the Worthington Company, at Elizabethport, N. J. The sand blast is in general use for cleaning castings, and is applied by very ingenious machines designed in that country.

"The Swiss are a free-thinking and intelligent people. Their history shows how far personal rights are esteemed and preserved by all conditions of men. They are also given in the highest degree to association in all forms affecting their business and social interests, but the relation between the employers and their men seems to me to partake more of the co-operative sentiment than in other countries. The men are treated with much respect, which they demand and deserve. Mr. Henry Sulzer, chief of his firm, is in the works at 8 o'clock each morning, and leaves there between 6 and 7 in the evening, and this, I am told, is the custom of owners in other works of the country. He, his sons and all concerned in the works have the respect of the men in their employ, and they in turn are respectful in all dealings with their workmen, who are nearly all Swiss people.

"Some years ago the firm built a 'casino' or clubhouse for the workmen, containing hot, cold and vapor baths, a dining-room with heating and cooking appliances, a library and surgery. This was done not as a patronizing gift to the men, but as a necessary adjunct to the works. At Oerlikon the company is just completing a similar building, which I think would cost in this country from $30,000 to $40,000, perhaps twice as much. There are eighty plain bathrooms, several vapor baths, a surgery and other offices, as before mentioned, and, as I before pointed out, these are not heralded as patronizing 'gifts' to the men, but are provided as a necessary part of the equipment, built out of profits that the men have earned. They have the management of these departments, and feel a proprietary interest in them.

"It is nearly useless to indulge in homilies on the management of skilled labor or to attempt much improvement of the circumstances in a country so long as men are hired and paid by time, irrespective of what they perform or produce. Successful reform lies in the direction of education, responsibility, wages regulated by their product and a system that provides declared profits and an equitable incidence for taxation. Workmen in Switzerland, such as work by time, receive only about one-half the rated wages paid here on this coast, but the real difference is much less than this and is indeed to a great extent made up by a difference in taxation and the cost of commodities and necessaries of life. When one wants to ascertain the rate of wages paid for skilled labor in any country, a 'payroll' is not the thing to examine. That is surrounded by intricate conditions not open to the average observer. The true way is to examine the men themselves. Look into their faces, note their clothing and tools; go into their houses, see them on Sundays and holidays, and, above all, attend their meetings when labor and other problems are discussed.

"Thus far the upper Rhine country has escaped labor discontent and disturbance, such as has occurred in other parts of Europe and in this country. Mr. Sulzer could inform me of but one strike in Switzerland, and that of unimportant extent.

"Swiss enterprise is overflowing the Confederacy on the Italian side. At Milan, in Italy, is a very successful engineering plant, managed by a relative of Mr. Charles Brown, of Basel, who reports a fair degree of skill among the Italian workmen and an extreme interest in and devotion to the work, which has of course the charm of novelty to the Italian workmen."

A Combination Die for Shallow Rectangular Shells.

BY WILLIAM DORAN.

The making of dies for the production of metal shells and boxes is not well understood by the average die or tool maker, who, as a rule, does not get a chance on this class of work; so I will endeavor to show the most practical and expedient method for the construction of a combination die for the blanking and drawing of shallow rectangular shells, of the shape shown in the two views of Fig. 1, and also explain a few kinks which may prove new and of interest.

As the press generally used on this class of work is single acting, we will show the die best adapted for it. When a double-acting press is used, dies of a distinctly different type are required. The first things to be considered, before starting on the die, are the thickness of metal to be used, the shape and size of the shell and the making of the templets. As for finding the blank, although some diemakers become so skillful through constant practice that they can find the blank without trial drawings, there is no reliable formula which will prove correct for any two different shapes or thicknesses of metal, as the conditions under which the metal is drawn and formed, whether in round or rectangular shapes or otherwise, are distinctly different in each case.

After the forgings for both punch and die (which should be of mild steel body and tool-steel faced) have been secured, the templets for the drawing portions of both punch and die should be made. These templets should be of stiff sheet metal, and finished all over to the exact shape and size to which the shell is to be drawn, the difference between them being one thickness of metal at all points. Then by using the smaller templet the drawing punch *K*, Fig. 3, should be finished to it. To finish the four corners of the punch, another templet, Fig. 2, is required. Take a piece of stiff sheet brass and drill and ream a hole at *D* to the exact radius to which the corners of the shell are required to be, then cut away the stock as shown and finish the two sides *C* and *B* to leave a perfect quarter of a circle. We fit all four corners of the drawing punch to it, finishing them smooth and free from lumps. Great care should be taken to get all four corners alike.

Having finished all the working points of the drawing punch K, we turn our at-

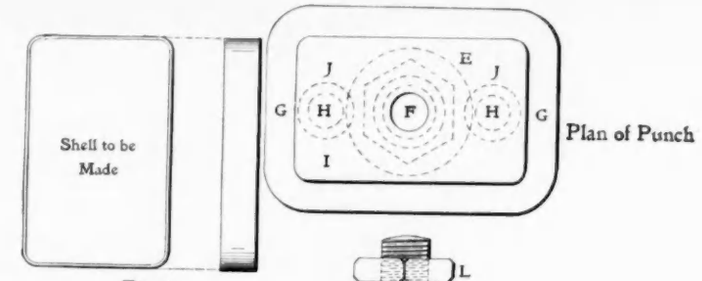
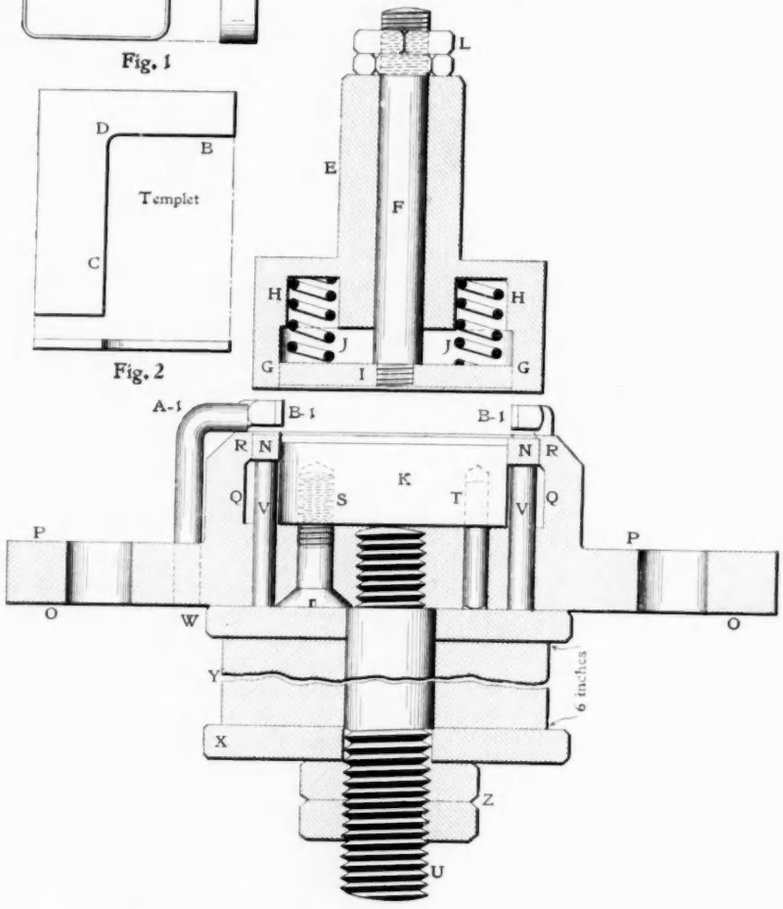


Fig. 1

Fig. 2



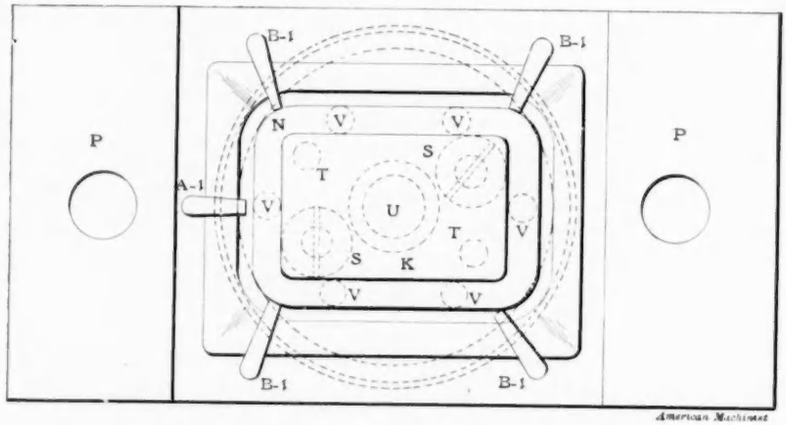


FIG. 3. COMBINATION DIE FOR SHALLOW RECTANGULAR SHELLS.

tention to the blanking punch, shown in Fig. 3, the inside of which is to be finished to act as the drawing die. This forging is first chucked and a hole is bored and reamed through its entire length to admit the pad stud *F*. An arbor is then driven into this hole and run on the lathe centers, and the stem or shank *E* is finished to fit the ram of the press. Both ends of the forging are then faced, and after the lines have been struck for the drawing die portion the arbor is removed and the work is set face up in the chuck of the universal milling machine, where, by the use of the vertical attachment, the die portion is finished to the lines and templet. First a roughing cutter is used and the inside at *G G* is roughed out. Then by using a sharp end cut mill the radius of which is one thickness of metal greater than that of the corners of the drawing punch *K*, and starting from one corner, so as to get a perfect quarter of a circle, the work is fed along one way until the distance from the start of the cut to the finish is exactly two thicknesses of metal longer than the length of the punch *K*. The cut is then started again at right angles with the first, and the width finished in the same manner, finishing it two thicknesses of metal wider than the punch. All four sides are finished in this manner, and the inside or bottom is finished flat and square with the sides. When the finishing of the die has been done properly, extra care being taken at the corners, the inside of the die will present a smooth appearance, and very little polishing will be required. The two holes *H H* for the pad springs *J J* are then let in by drilling, and the pad *I* is got out. This pad is of mild steel, about 5-16 inch thick, and is finished to fit nicely within the die. A hole is drilled and tapped in the center and the pad stud *F* is screwed tightly into it. This pad stud is also threaded at the other end, for the adjusting nuts *L*. The parts of the die are then assembled within the punch, and we are then ready to make the trial drawings and find the blank, as the exact size and shape of it have to be found before the blanking portions of either punch or die can be finished.

To make these trial drawings two things are necessary—first, a blank holder ring, which afterwards forms a permanent part of the die, and, second, a trial spring barrel and plate. The blank holder is usually a forging of tool steel, and it is shown at *N N* in both the plan and cross-sectional view of the die in Fig. 3. This blank holder should be about ⅜ inch thick, and, after being planed on both sides, it should be worked out on the inside to the templet, to fit nicely at all points around the drawing punch *K*. The outer edges of the blank holder are left rough until the blanking die has been finished.

We now work out several different sizes of templets, in size and shape somewhere near what we think will be required to form the shell, making two sizes of each, one to draw up and the other for reference. These templets should be got out of the same stock that is to be used for the shells. The manner of making the trial draws is shown in Fig. 4. The spring barrel is of rubber, 4 inches in diameter and 6 inches long, with a clearance hole straight through it to admit the barrel stud, which is screwed tightly into the bottom of the barrel plate. The tension pins for supporting the blank holder and blank-holder pad are six in number, and they are made extra strong so as to allow of using the spring barrel for trial draws

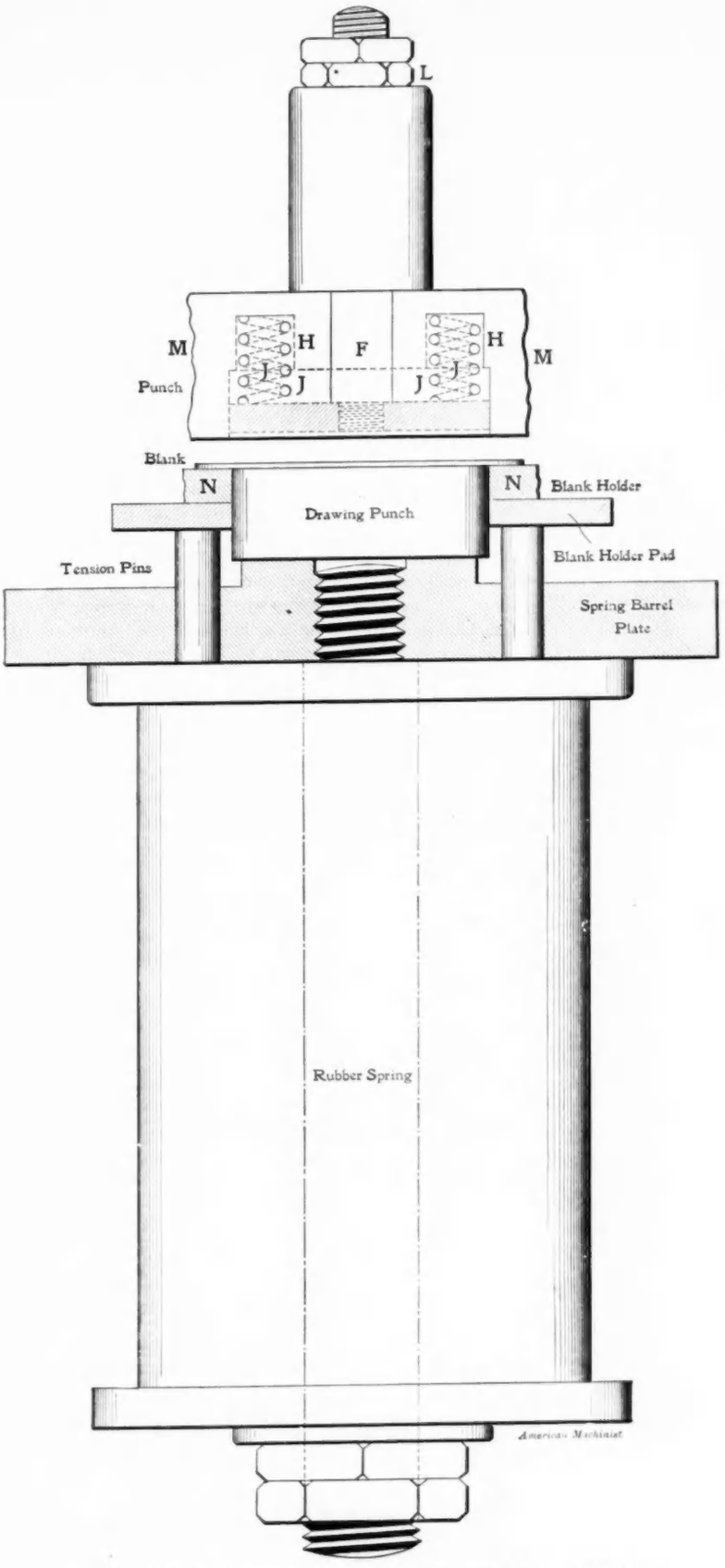


FIG. 4. ARRANGEMENT FOR GETTING SIZE AND SHAPE FOR BLANKS.

of a number of different sized shells. These pins have to be finished all to exactly the same length, so as to allow of the blank, which is to be drawn, being held with an equal tension at all points. The parts of this trial spring barrel are assembled as shown with the plate resting on the press bolster, and the barrel projecting down through the hole. The drawing punch is located on the plate, and the blank-holder pad and blank holder are placed around it as shown. The tension adjusting nuts on the end of the barrel stud are then adjusted so that the blank will be held with sufficient tension between the blank holder and the face of the punch, so that as the punch descends and the blank is being drawn up into it the metal will not wrinkle or crimp.

One of the templets or blanks which we have got out is now placed on the blank holder, as in the position shown, getting it approximately central with the drawing punch. The punch proper, in which is located the drawing die, is fastened within the ram of the press and the barrel plate shifted and set so that the die is central with it. The punch or drawing die is then brought down by revolving the press flywheel by hand until the templet or blank has been drawn up. The punch is then raised and the drawn shell is expelled by the spring pad *I*. We are now able to note where we have any excess of metal and where we have a deficiency in the blank. We now take another blank and increase or decrease the size at any point that the shape of the drawn shell may require. We then make a duplicate of this templet and draw it up. By repeating this operation a few times we are at last able to determine the exact size and shape of the blank. Sometimes the blank may be found in two trial draws, and often, when the shape of the shell is odd or intricate, it is necessary to make quite a number of templets and trial draws before the exact shape and size of the blank can be determined.

Having found the correct blank for the shell and made a perfect templet, we are ready to go ahead and finish the die. By reverting to Fig. 3, the method of construction will be clearly understood. The forging for the blanking die is first planed on the bottom at *O* and a cut is taken over the ends at *P P*. A hole is then drilled in each end, as shown, and the forging is bolted tightly on the table of the milling machine. Then by the use of the vertical attachment the die is finished to the templet, finishing it straight for about 3/8 inch of its depth and then undercutting, as shown at *Q Q*. The outside of the die is sheared away, leaving about a 3-16 inch margin all around the cutting edge, as shown in the plan of the die. The blank-holder ring *N* is then finished to fit nicely within the die, finishing the outside so that the opening for the drawing punch will be exactly in the center of it. The blank holder is then hardened, drawn, and ground true and flat on both sides.

To locate the drawing punch *K* central within the blanking die the blank holder *N* is entered within the blanking die and the drawing punch *K* is located within the blank holder. Four holes are then drilled through the back of the blanking die and

transferred into the drawing punch, two for the flat-head screws *S S* and two for the dowels *T T*. The punch and blank holder are then removed and the holes for the six blank-holder tension pins *V* drilled through, distributing them equally around the inside of the die. After the holes for the four stripping pins *B*1 and the stop-pin *A*1 are drilled and the hole for the spring barrel stud *U* let in and tapped, we are ready to harden and temper the die. To do this right, the die should be carefully heated in either a gas muffle or a charcoal furnace to an even cherry red and then quenched in a tub of water, which should not be too cold. After hardening, the die should be placed on the fire and warmed slightly. The face of the die should then be ground and the outside margin and the inside polished. To temper the die heat a flat block of cast iron (large enough to hold the heat for some time) and when it is red hot place the die face up on it, wipe the polished top with an oily piece of waste and the various stages of tempers can then be noted and when a light straw appears remove the die and allow it to cool off slowly.

The finishing of the blanking punch is a very simple matter, all that is necessary to attain good results being a little care and a few methods of construction which are standard. The punch is placed on an arbor and located on the miller centers and the four sides are milled down almost to the finish size. The edges of the punch are then slightly beveled and it is placed under the press and sheared a little ways into the die. It is then removed and the surplus stock is worked away and it is filed to a snug fit within the die. After the face of the punch has been slightly sheared, and the edges of the drawing die slightly rounded and highly polished, the punch is hardened and then drawn by laying it alternately on each of its four sides on a hot plate, tempering the cutting edges to a dark blue and leaving the inside or drawing die portion as hard as possible. When finishing the blanking portion of the punch, care has to be taken to do it so that the drawing portion will be perfectly central.

The drawing punch *K* is hardened and drawn slightly. It is then fastened and located within the blanking die by means of two flat-head screws *S S* and the two dowel pins *T T*. This punch should be highly polished for the shell to have a smooth appearance. The four stripper pins should be of stiff drill rod and bent and driven in to the base of the blanking die in the position shown, projecting out over the blanking die so that the sides of the blanking punch will just clear them. The stop-pin *A*1 is also of drill rod. The two spring barrel washers *W* and *Y* are of cast iron, and faced on both sides, as are also the adjustable nuts *Z*.

When in operation, the punch and die are set up in the press in the relative positions shown in Fig. 3, and the stroke is set so that the pad I will bottom. The strip of metal to be punched is then fed under the stripper pins and against the stop-pin *A*1. The punch descending, the metal is punched and the blank is held tightly between the face of the punch and the blank holder, the tension on it increasing as the punch descends, and the shell is drawn. As the press reaches the end of its stroke, the drawing punch *K* forces the shell solidly against the pad *I*, flattening the bottom and squaring the edges. As the punch rises, the drawn and finished shell is expelled from the punch by the spring pad *I*, and (as the press is tilted to an angle of 15 degrees) it drops off at the back, and the scrap is stripped from the punch by the four stripping pins.

Combination dies of the design and construction here shown can be used to the best advantage for the blanking and drawing of shells which do not exceed 1 inch in hight, as, in order to draw that amount, the rubber spring barrel is compressed to the maximum, and to compress it more would cause the metal to either stretch excessively or to split. So when it is desired to draw shells over 1 inch in hight, more than one die is required.

The Three-Bearing Lathe.

BY A. H. CLEAVES.

This particular lathe in the watch factories is called a plate lathe, as the pillar plates and bridges are faced off in it. Similar lathes for smaller work are generally made in two sizes. These lathes are used for work in which exact shoulder cuts and depths are required, and are made to overcome the irregularities of the spring collet, or split chuck when it is used in the ordinary way. This is caused by the different strain put on the chuck in tightening it on the work. As the draw-in spindle is always in one position, the chuck will be drawn in as the pressure is applied; and the variation caused in this way, especially on watch work, where the depth measurements are very short, is important.

In the three-bearing lathe this fault is overcome as follows: *A*, Fig. 1, is the chuck or collet, and *B* ordinarily the draw-in spindle, which in this case is screwed up to the shoulder at *C* permanently, a three-lipped spanner being used in the chuck slots usually for the purpose. The spindle *B* has a collar at *D*. Another spindle *E* is for closing in the chuck. It takes its motion from the nut *F*, and it will be seen that the strain in closing the chuck is directly between the chuck angle and the shoulder *D*. Any end-thrust of the running parts is taken care of at *G*, a hardened collar, and *H*, a bushing with adjusting thread and set-screw, and supplementary collar *I*.

A heavy handle *J* for tightening the chuck is one of the main features. The thumb pressed on *K* enters the stud *L* into

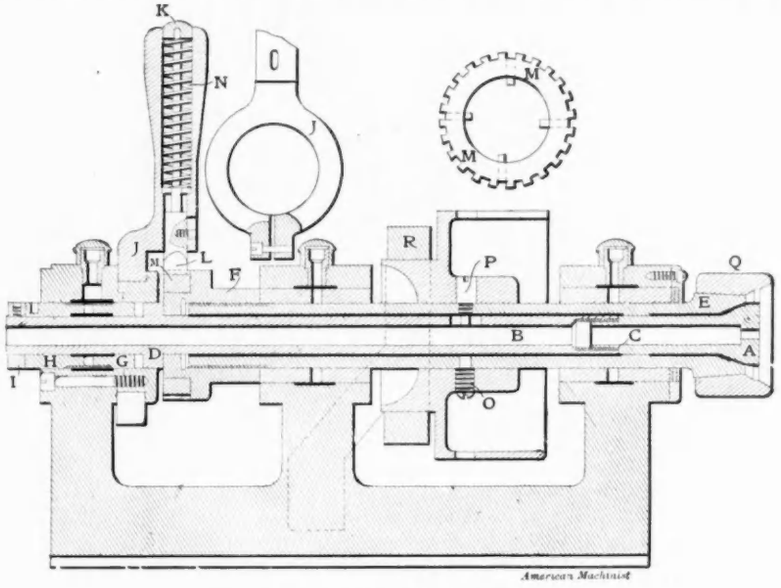


FIG. 1. A THREE-BEARING LATHE.

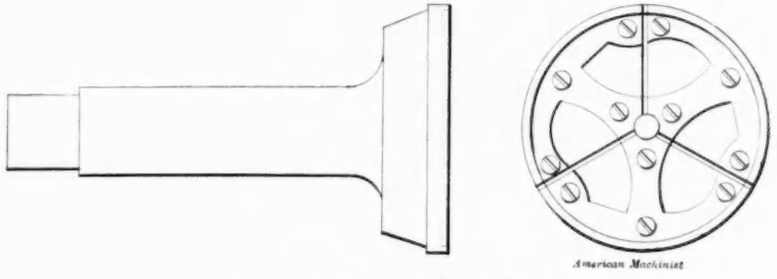


FIG. 2. CHUCK FOR PLATE LATHE.

a notch of the hardened ring *M* when in use, and the spring *N* keeps the same out at other times. The screw *O* on the pulley revolves *E*, and the screw *P* does the same for *B* and slides in a slot in the latter. *Q* is a hardened and ground ring used on *E* when needed for closing large chucks.

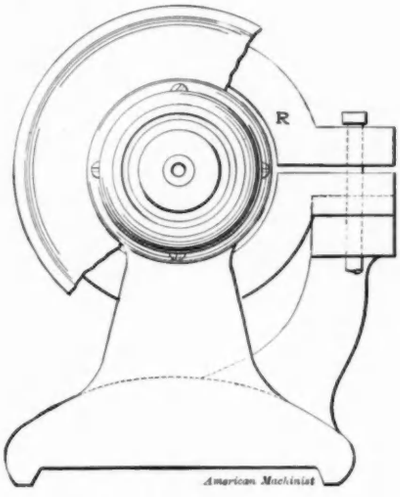


FIG. 3. SHOWING THE BRAKE.

Fig. 2 shows how several pieces of a kind may be held in one chuck.

R, Fig. 3, is the brake, a universal adjunct where the work must be removed often and the lathe stopped, too. It is closed with a wire *W* attached to a footboard.

In Fig. 4 an important part of the brake is shown on a small common lathe. The brake *S* is pivoted at *T* and is provided with a spring to lift up *S* and keep it clear from the pulley when not in use, and the pivot brings the whole brake to bear on the pulley.

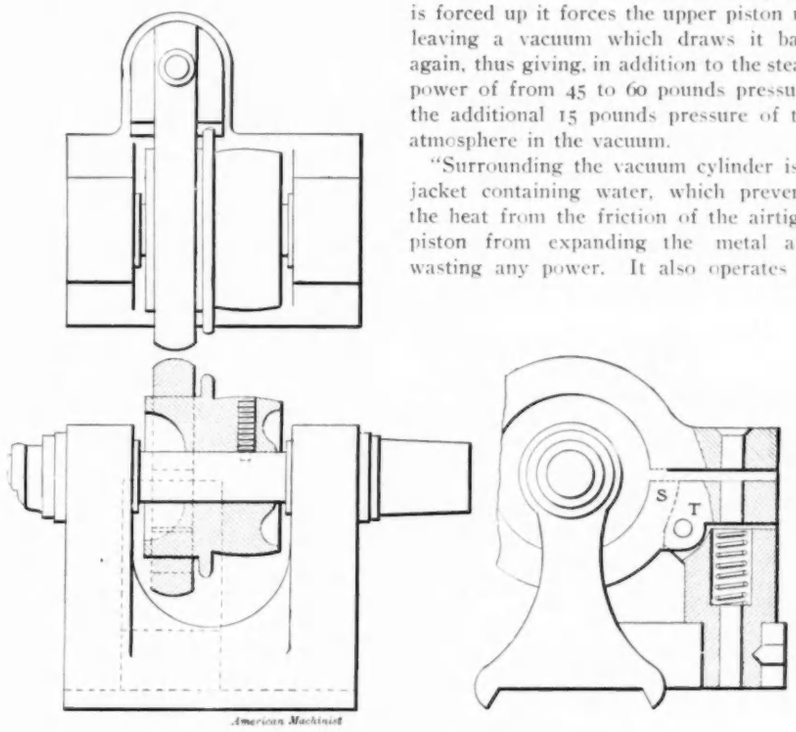


FIG. 4. BRAKE, WITH PIVOT AND SPRING.

Steam Engine Construction Revolutionized Again.

The inventors of revolutionary modifications of the steam engine seem to be very active just now. The following is a description of a new one which hails from Des Moines, Iowa:

"The principle of this motor is that it uses but an infinitely small amount of fuel and water, and is therefore very inexpensive in operation. In the ordinary engine a large amount of fuel is necessary in order to keep a large volume of water continually boiling to provide the necessary steam, although but a small quantity of steam is used at any one time. In this invention the boiler is practically dispensed with, hence also the large amount of fuel and water required in the ordinary engine. A very small quantity of water in the lower end of what might be called the steam chest proper does the work. This is called the boiler in this motor.

"Operating in this is a long, hollow piston, lacking about 1-32 inch of fitting to the sides of the boiler, thus leaving room for a steam cushion all the way around it and also making it possible for the condensed steam to run down the sides. A rod connected with the piston passes up through the center of another piston which operates in a vacuum cylinder above the boiler and is geared direct to the flywheel. The upper piston referred to fits absolutely airtight in the vacuum cylinder and is geared to the shaft in the usual crank manner. As the steam piston is forced up it forces the upper piston up, leaving a vacuum which draws it back again, thus giving, in addition to the steam power of from 45 to 60 pounds pressure, the additional 15 pounds pressure of the atmosphere in the vacuum.

"Surrounding the vacuum cylinder is a jacket containing water, which prevents the heat from the friction of the airtight piston from expanding the metal and wasting any power. It also operates to keep the upper end of the boiler cool and assists in the condensation of the steam which trickles down to the lower end of the boiler, where it immediately becomes steam again and is used over and over."

We are informed that a one-sixteenth of a horse-power model "requires less than three teaspoonfuls of water"; that a one-half horse-power engine "is operating nicely with 1½ ounces of water and using a common gas jet for fuel," while the inventor "expects to demonstrate" that a locomotive "can be run from New York to San Francisco with one barrel of crude oil and three or four barrels of water."

We hope the inventor has sent a marked copy to the president of the locomotive trust, and we would like to know how he feels when he has read it.

The Educational Work of the Y. M. C. A.

The following from the Boston "Transcript" gives an account of the educational work of the Y. M. C. A., the extent of which will surprise most people:

"Few people outside those immediately interested realize the growth and extent of the educational work carried on by the Young Men's Christian Association, amounting, as a matter of fact, to the functions of a national university of practical teaching, with branches in every city of the country. The system of administration naturally differs from that of our public schools. Standard courses, it seems, are maintained by international examinations. Branches from grammar school to university find legitimate place. Pupils are of all conditions and classes of men. It follows that the classes are composed of men already in the whirl of life, past the schoolroom, able to devote only a little time to study, anxious to do all they can, and unwilling to spend time on much that would be unessential. With fifty subjects taught, the courses are certainly adapted to the special needs of the associations.

"It is very significant that there are 27,000 men spending on an average forty-eight hours of recitation each season, or double the number of ten years ago. Last year, it seems, 1,520 certificates were won by men in 115 different associations, the movement having so developed in organization and in standard of work done that 110 colleges and universities recognize these certificates for matriculation. The board of examiners certainly presents an array of names that should command confidence, including Hamilton W. Mabie, Professor Adams of Johns Hopkins University, Professor Hodge of Clark University, Professor Beman of the University of Michigan, Professor Thomas of Columbia University, and a dozen others of equally high repute in educational work."

Molding Gap Lathe Beds.

BY GEORGE BUCHANAN.

Light and medium lathe beds are usually better and quicker molded in flasks made for the purpose than in the floor. The flasks should be made to take the longest bed, so that they may be used for either long or short, with or without gap, and also for at least two different sizes. Of course shops doing a special line of work may make a flask for each pattern, but it will not always pay to do this.

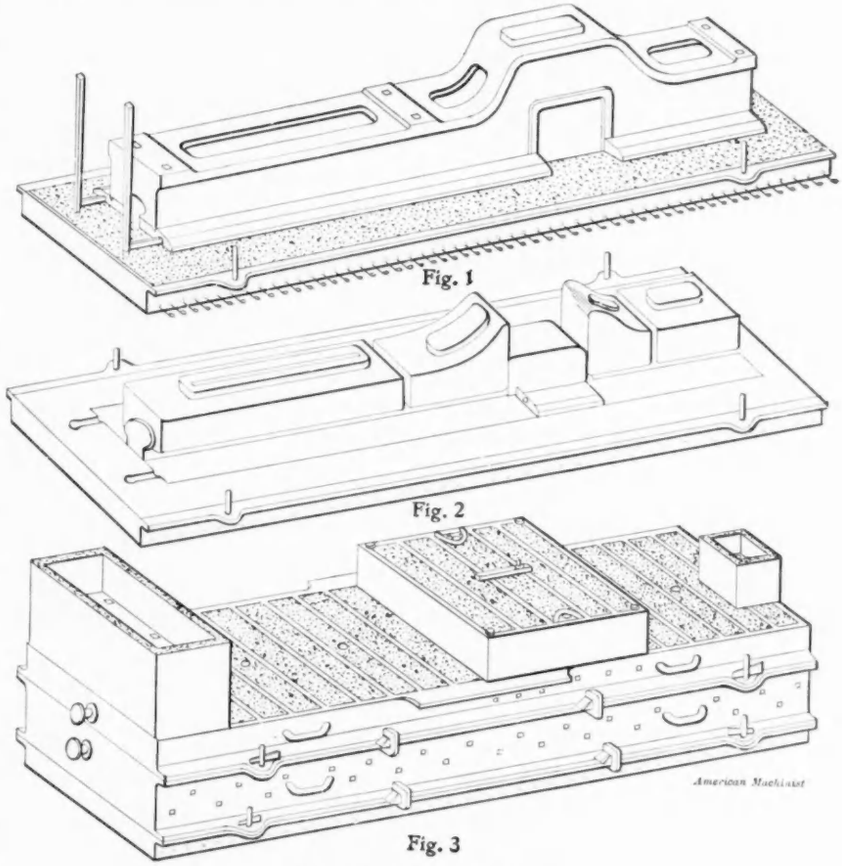
In many cases the time taken to mold a bed in the floor may be halved if it is made in a suitable box. The advantage of using the flask shows greatest when the bed pattern is complete, leaving its own cores. It is usual when molding such beds in the floor to lift the green-sand cores out of the mold on suitable bars and plates made especially for the purpose. When made in the box, however, the lifting away of the cope leaves the cores in a very desirable position for finishing, and specially made bars and plates for the cores are not required, the ordinary foundry stock of rods and irons being sufficient; the mold is quickly closed and clamped, and the cinder bed also is unnecessary.

Fig. 1 shows the drag with the bed struck off level with the edge and the pattern in position. This pattern is 10 feet long, 12 inches deep and has a gap about 20 inches from the end of the pattern. In starting on this job, the drag is set level on the floor, sand is filled in and rammed and vent rods are set. A pair of straight edges are bedded in the drag with the right amount of camber. If the order is for more than one iron straight edges are best, as they are left in the drag until the order is through, and they require only the one setting. Black sand having been rammed up to within an inch of the hight of bed required, a bed of facing is lightly rammed and the bed is struck off and well vented. The tops of the vent holes are now filled up by pegging each vent hole with a small piece of round iron, striking the top of the hole at an angle of about 45 degrees, so as not to stop the vent up deep down. Finely sifted facing is applied and the bed is finished off. The bed is now sprigged or bradded for a few inches in front of the runners to prevent the metal cutting into the bed, the heads of the brads being even with the face of the bed. The pattern is now set and the cope lowered on. A few weights are placed on the pattern to prevent its moving while being rammed, and the ramming up of the cope is proceeded with. The ramming should be very firm around the V's, or straining will result, and the irons bedded over the backs of the V's without the slightest spring. Wasters are sometimes the result of badly bedded irons. Sometimes when the pattern is removed from the mold the sand will drop off where the spring of the iron is; but it will often hold up and not be detected in the finishing of the mold, but when the metal comes along it will wash it off and the result is generally a waster.

The ramming is continued, care being taken to keep at least an inch and a half away from the pattern with the rammer. About six inches above the V's it is a good plan to well vent and lay a train of ashes free from dust along, leading them to holes in the sides of the cope. Having reached the top of the pattern the inside of the mold is next proceeded with. Stiff rods are driven through the drag into the floor and the ramming and ironing and venting are similar to the outside, except that the ramming is comparatively lighter, and underneath the top flanges very little ramming is necessary.

The joint is next made and the top part set in place. Gate pin and vent pins are placed and the top rammed and lifted off and turned over on horses. The cope joint is eased a little all around the pattern, to prevent crushes, and the pattern is rapped and drawn. The cope is next lifted off and set at a convenient hight for finishing, and if the pattern is in good condition the mold is soon ready for blacking. A good quality of plumbago should be used and placed on with a flat camel hair brush. The cope is washed over with a solution of core gum or molasses and skin dried. The drag also is washed near and around the gates and skin dried. The vent rods are now removed and the cope lowered on. Fig. 2 shows the drag ready for the cope. The top is now placed on the cope, all vents being properly connected, and the mold is clamped and runners are made, as shown in Fig. 3. The gap piece in the top part of the box is removed when not required, holes being provided to bolt loose bars to for a flat top, and beds of any length, up to the above are handily made, only the length required being rammed up.

Wrexham, Wales.



MOLDING A GAP LATHE BED.

A New Stop Valve.

The accompanying illustrations and the following description of a new English stop valve are extracted from "The Practical Engineer." We could wish for fuller particulars regarding the packing *H:*

"Many attempts have been made at various times to produce a stop valve in which the alteration of direction of flow of the fluid is reduced to a minimum. This result is, of course, achieved in most of the straightway or gate valves, but there are objections to the use of such valves, and in order to solve the problem presented Mr. E. Williams, of Heaton, Newcastle-on-Tyne, has designed the valve represented in Figs. 1 and 2. From these figures it will be noticed that the valve consists practically of three parts, two of which form the body and the third the

valve. The two halves of the body are held together in place by means of distance pieces and bolts, a space being left to allow the hand wheel to operate the valve. The valve is cylindrically shaped, one end terminating in a dome and forming a valve which closes the passageway by being forced against the seat *G*. Just beyond this seating will be noticed a series of apertures *D*, through which the steam or other fluid passes to the inside of the valve when it is opened. (See Fig. 2.) At the center of the valve a disk projects, having

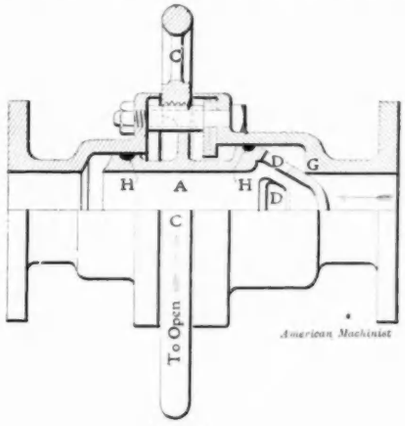


Fig. 1

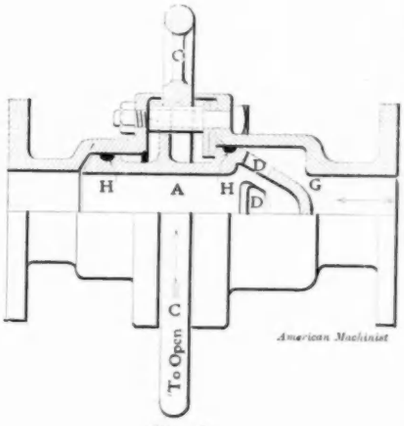


Fig. 2

A NEW ENGLISH STOP VALVE.

cut upon the rim a screw thread which screws into the hand wheel *C*, so that when the hand wheel is rotated the valve *A* moves either to or from its seat *G*. Packing at *H*, each end of the valve, is provided to prevent leakage. The valve is shown closed in Fig. 1 and open in Fig. 2.

"We understand that the object the inventor had in view in producing this design was to satisfy the requirements of chemical work, and for this purpose the valve is constructed of such materials to reach the working parts and so lengthening the life of the valve by preventing the otherwise rapid deterioration due to corrosion. Mr. Williams tells us that he has one in use under a pressure of 150 pounds per square inch with very satisfactory results, its weight being about half that of the pattern it superseded, as well as costing about 50 per cent. less to manufacture."

Pan-American Searchlight Signals to Toronto.

Signals from the 30-inch searchlight on the Electric Tower of the Pan-American Exposition were sent to Niagara Falls, July 25, by Prof. Geo. F. Sever, superintendent of electrical exhibits, in the presence of the electrical jury, thus demonstrating the feasibility of this method of signalling at night.

Since that time searchlight signals have been sent from Buffalo to Toronto, a distance of 58 miles, through arrangements completed by Prof. Sever in co-operation with Mr. Wm. S. Aldrich, consulting electrical engineer, of Toronto. The first trial was made, 9 to 10 P. M., August 9, with clouds over Toronto. The local illumination of the overhead sky by the electric arc lights in the streets of Toronto effectually prevented any discrimination being made between the local and the Buffalo illumination of the clouds. The second trial was made, 9.50 to 10.15 P. M., August 13, with a perfectly clear atmosphere. Owing to the smoke settling down over the city, no signals could be discerned from the top of the Municipal Hall tower, Toronto. This was the prearranged objective point for both experiments. Through the courtesy of the Bell Telephone Company, of Ontario, represented by Mr. K. J. Dunstan, of Toronto, special long-distance communication was arranged between the top of the tower and the Electric Tower at the Pan-American, so that every detail of the experiment could be followed. The special instructions were to depress the searchlight to the lake horizon, bearing on the Municipal Hall tower, Toronto; then to sweep the horizon a definite angle, to the right and left of this bearing, and later to elevate and depress the light at the original bearing. All of these signals were very clearly discerned during the second trial by Mr. C. H. Rust, city engineer, Toronto, with party located on Centre Island, two miles off shore from the city.

Letters from Practical Men

Pattern Numbers for Combination Patterns.

Editor American Machinist:

While reading the article on the drawing room methods of the General Electric Company it occurred to me that some might be interested in a way we have of marking gears that are used on various machines and all cast from one pattern, also where there are several gears on the same machine from one pattern but having different sizes of bore and hub. We formerly had the pattern number and letter fixed in the arm of the gear but with this arrangement it was necessary to write for the size of hole before we could fill a repair order from the number.

We now have a separate hub pattern for each size of bore on each machine and on one of the halves of this is a piece of hardwood about ¼ inch thick and of a width and length to suit the letters of the pattern number for this particular combination of gear and hub. It lies flat against the gear arm in molding and gives clean, sharp letters in the casting. On the reverse side is stamped the number of teeth, pitch, face, etc., of the gear it belongs to and by this it is easy to get the parts together right.

The shop drawings show the dimensions of the gear and give the size of bore, length of hub, etc., for each pattern number. With this arrangement there can be no uncertainty as to any of the dimensions of the part wanted. While we have adopted this method on gears only I do not think it is confined to gears and pulleys in its application. There is usually some small part of a pattern that is removable on which the numbers could be fixed.

E. R. Plaisted.

Another Way to Make the Punch.

Editor American Machinist:

While reading with much interest and profit the article by Mr. Doran on "Punching and Forming Heavy Blanks in One Operation," on page 784, while no one would question the strength and solidity attained by making the holder and punch a solid forging, it adds unnecessarily to the cost of the work, without really adding anything to the life of the punch, and I therefore venture to describe a way that seems to me to be better. Since practically the only wear upon a punch is at the cutting edge, it is evident that the ease with which this part can be replaced when broken or worn out should be the first consideration, and with that in view the following method has been adopted; while if constructed as Mr. Doran describes, a corner broken off the blanking punch would completely ruin the whole forging.

As soon as the die has been drilled, in the usual way, take for the punch holder *H*, Fig. 1, a piece of soft steel about ⅞ inch thick and otherwise about the same size as the die. Plane both sides of this and clamp the die and this punch holder together, so as to use the die as a jig, to start the drill in the holder, as the one is almost a duplicate of the other; taking care, of course, that the top of the die is held next to what is to be the bottom of the holder and afterwards always working to have them in that same relative position when finished. If there are holes large enough to be bored in the lathe, they can be marked off while the two are still clamped, though in some cases it may be found convenient to bore these holes first, in the lathe, through both at once.

After the die has been filed up and tem-

pered, select a piece of tool steel large enough to make the punch *P*, Fig. 1, and about 2¼ inches thick, plane the top and bottom sides and grind the tool marks out of the latter, so that it will take the bluestone and mark easily. Then on this surface scribe off from the finished die the shape the punch is to be, put this piece in the shaper vise and shape to within 1-32 inch of the lines. Then with a file chamfer the edge right down to the lines and carefully shape off the remaining stock. By thus chamfering, it is an easy matter to work very close to the lines, while it also prevents the edges from breaking out.

Now fit the punch in the usual way, allowing it to enter the die about ¾ inch, taking care to file as little as possible off the top side, so as to leave it larger there than where it enters the die, as seen exaggerated at *A*, Fig. 1; thus preventing the punch from pulling out of the holder. Where heavy stock is to be pressed it will

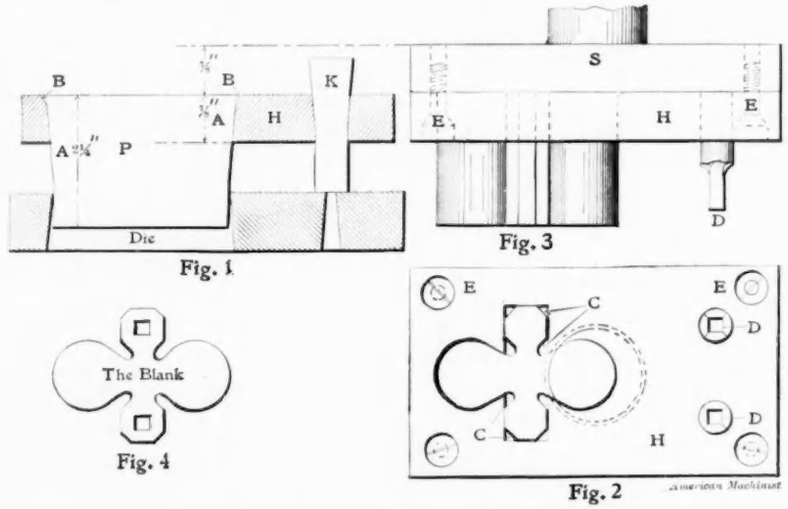


Fig. 1. Fig. 3. Fig. 4. Fig. 2.

ANOTHER WAY TO MAKE THE PUNCH.

sometimes be better to pene the top of the punch as well, so as to upset the edge slightly (see *B*, Fig. 1).

It is now ready to be hardened and tempered, and should it have warped enough in this operation to prevent its freely entering the die, this shape of punch is easy to get at with an emery wheel to relieve it. After drilling out the small holes in the holder, which were located from the die to a size large enough for the shanks *K*, Fig. 1, of the small punches to drive in tight, fit the blanking punch in the holder.

This is a much easier and quicker job than it would appear, as it is not necessary to file the holder to the exact shape of the punch if the latter is of irregular shape and difficult to follow; for any grooves or fancy curves may be skipped, as seen at *C*, Fig. 2, when filing up the holder. Since the punch is hard and the holder of soft steel, the former will, if placed under the press, shear off from the holder a surprising amount of stock to let itself in. In this way force the two together until they are flush at the top.

Now for the small punches. If they are to be round, it is an easy matter to turn them the proper size and drive them in place; but if they are of irregular shape or square, as shown at *D*, Fig. 2, they should be cut off the rod the required length and their outsides just eased off a little at one end, so that they will tap easily through the holder within about ¾ inch of the whole distance. Now take the die and slip it over the blanking punch until it rests on these piercing punches, as shown at Fig. 1. Then with a sharp scriber mark off from the die, on the ends of these little punches, the shape they are to be. Tap them out again, file to the lines, temper and drive them in place. To replace them properly sometimes requires a little manipulation, but if the die is used to guide them, as it was used to mark them, little trouble will be experienced. It will readily be seen that when any of these punches become broken, or ground back too far, it is a comparatively small job to knock the defective one out and make another.

Now we come to the economical feature of this method. It is for a shop where many dies are made and kept, a great saving and convenience compared with any of the other methods that I have yet seen. Instead of turning up a round shank to fit the press for every die that is made, make a few shanks similar to the one shown at *S*, Fig. 3, which will be interchangeable with all punches, within certain limits. These shanks may be made of cast iron, turned and faced, drilled and tapped for screws *E*, by which the punch holder is held. These screws for ordinary work need not be over 5-16 inch, as they get little strain. Dowel pins might be used, but I have never found them necessary.

In most shops dies spend more time on the shelf than they do in the press, and often their storage becomes quite a serious consideration. By using interchangeable shanks, which can be taken off as soon as the dies are to be laid away, and by setting the punches inside of their dies, a very compact arrangement is possible. Then these tools may be piled two or three on top of each other, thus saving much valuable space that would otherwise be occupied by many costly holders.

WILFRID J. THOMPSON.

Pittsburgh, Pa.

Hard and Dangerous Boiler Practice Years Ago.

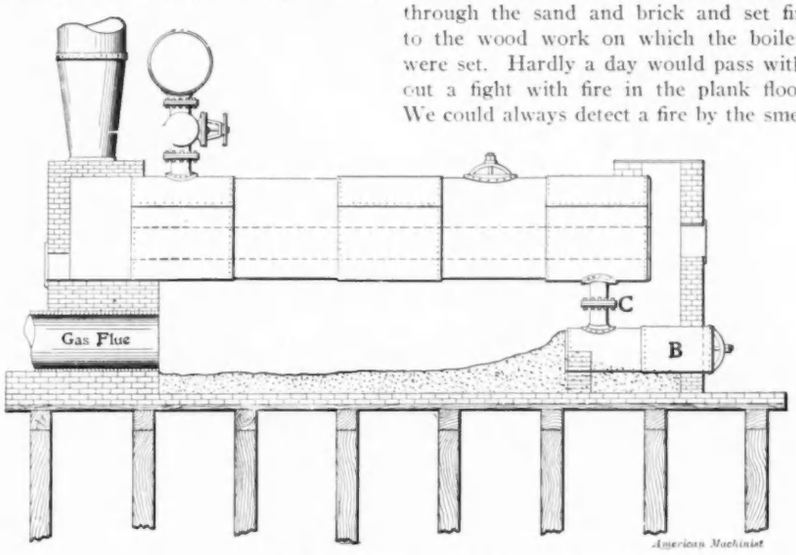
Editor American Machinist:

The boiler settings of the old pioneer furnaces at Negaunee, Michigan, were perhaps the most curious, absurd and dangerous ever constructed. The charcoal furnaces of the day were usually built against a bank, or, more properly speaking, against the side of a hill, so that the top of the stack would be on a level with the bank. This was done to enable the fuel and ores to be unloaded on the same level as the furnace top into which they had to be fed, thus avoiding the use of all hoisting machinery. The bank against which these were built was about half as high as the stacks. In those days it was supposed to be necessary to set the boilers on a level with the furnace top, so that the gases for burning under them could be conducted to them from a point about 6 feet below the top, through a flue without any downward course. In order to bring the boilers up to the proper level a foundation about 12 feet high was built. This foundation, instead of being of brick or stone, was made as shown by the sketch. The trestles were made of 12x12-inch pine, and were placed about 4 feet apart. These were planked over with 3-inch pine plank. On the top of this the boilers were set, the plank being covered with two layers of brick and the brick with about 2 feet of sand. There were two boilers for each furnace stack, 48 inches diameter, 30 feet long, and they had two flues each. There was a steam drum extending across from one to the other, connected to them by cast-iron nozzles, as shown. All the joints had ordinary rubber gaskets and were bolted, as shown. The mud drums *B* also were connected to the boilers by cast-iron nozzles in the same way, except that no gaskets were used, the joint *C* being at all times exposed to the intense heat of the burning gases.

These furnaces usually were kept in continuous operation from nine to eighteen months. When I took charge of their machinery they had been running about six months. The joints between the boilers and the steam drum were leaking badly and were driven full of pine-wood wedges to stop partially the escape of steam, which, however, was still so great that it was impossible to hear one's self talk when within 50 feet of them. The joints between the mud drum and boilers also were leaking badly. To stop these leaks we were obliged to shut down the engine, cool the red-hot walls, to prevent the making of more steam, and open the safety valve.

When all the steam had escaped we removed the bolts in the flange and jacked up the drum until the joints were open enough to allow us to slip in gaskets made of sheet copper ⅛ inch thick. The flanges were considerably furrowed by the escaping steam, which made it necessary to put copper washers under both bolt heads and nuts, and also to calk the gasket all around the joint. Every preparation was made before commencing the job. It therefore required a very short time to fix the joints.

We found the bolts in the mud drum joint so badly burned that those on the side against which the gas struck required but a slight tap of the hammer to knock off either the head or nut. There were only three or four out of the twelve or fourteen that had any holding power to speak of. In these joints we put a very thin copper gasket, put in new bolts and laid up a course of fire-brick around the connection. This made a temporary fix. I, however,



AN OLD BOILER SETTING.

did not feel satisfied with the bolts and about once a month we would shut off the gas, cool down the wall a little, throw in a few pieces of wet plank to stand on, crawl through the back door, knock down the bricks, and, while full pressure of steam was on, take out and renew the bolts one by one. One of us would go in and remove a bolt, and out again, then another one would go in and put in a new bolt. It was not necessary to urge the man who was in to hurry. The heat was so great that by the time his work on one bolt was done he was about exhausted. I frequently had my hair badly scorched while doing this work.

One of the hardest jobs we had was keeping the boilers clear of a coating of soot or dust, which was a very poor conductor of heat. This we had to remove from the outer surface of the boiler, and also from the flues. The practice was to wash them out by attaching a steam hose to the blow-off pipes connected to the mud drum. In order to get at the flues, we set up a scaffold about 8 feet high at the back end. Then, with a man at the nozzle and one at the valve to let on and shut off the water, we would turn the stream through the flues, washing the deposit out at the stack end. This would go well enough as long as we did not get boiling water, but just as soon as that occurred, the stream would spread and strike the end of the boilers and come back on the man at the nozzle.

It was then a case of either holding on until the valve could be closed or dropping the nozzle and jumping from the scaffold. In either case a man was lucky if he got off without being scalded. I went through the experience once, but afterward nothing would induce me to try it again or allow anyone else to do so. We made a steam connection instead of water. It was not so effective, but much less dangerous and injurious to the boilers.

The intense heat would penetrate down through the sand and brick and set fire to the wood work on which the boilers were set. Hardly a day would pass without a fight with fire in the plank floor. We could always detect a fire by the smell of burning pine. No blaze would show, but it would smoulder and smoke and was hard to locate. We kept a small hose connected to one of our feed pumps for use in quenching these fires and at leisure times the engineer in charge would wet down all the timbers. This almost constant burning gradually burned away the plank and made it necessary to renew the support in some way. To do this we cast columns and plates in our makeshift foundry, and one by one we removed the wooden trestle and a section of plank (if not already burned out) and set up the iron columns and plates.

The time has gone by when young mechanics are called upon to contend with such dangerous and difficult conditions, but I fear many of them do not appreciate the greatly improved circumstances amid which they live as compared with what they were twenty-five years ago.

B. W. T.

Drilling Glass.

Editor American Machinist:

Regarding the inquiry of Mr. Ridderhoff in your issue No. 31, would say that in glass drilling the exact grade of the emery amounts to less than the exact lubricant. I would give you the recipe if it had not been furnished to me confidentially. For most purposes, however, turpentine with a good portion of camphor dissolved in it will answer the purpose. For holes up to ½ inch use flat drills made of Mushet steel; drill from both sides and ream the hole out with a taper reamer.

Larger holes are best cored out with brass tubing and diamond dust. This material costs about $6 per carat, but can be collected, so that a carat should drill about fifteen 1-inch holes, or more; allowing five minutes to the hole in heavy plate glass with the above lubricant. For this size hole and any other which I would core out, I would use No. 60 emery.

Where a good deal of work has to be done it will pay to secure a lubricant known to give good results. W.

A Slot Gage.

Editor American Machinist:

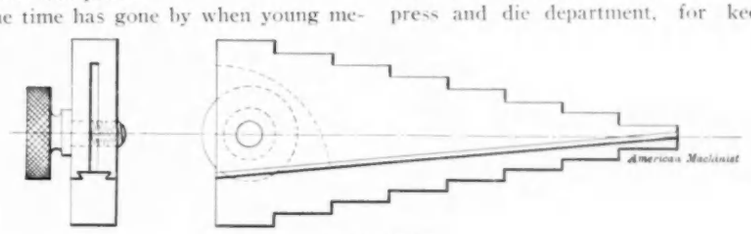
The gage here shown is for measuring slots, and when set so that the smallest end is ⅛ inch it will vary by eighths up to an inch, if properly made. The different steps are all lapped to a nice, smooth surface and parallel, and almost any number of sizes can be obtained by sliding the gage up or down, using the most of each step or using part of one and part of another. In this way a great many measurements can be obtained, but not all between ⅛ and an inch. The gage is split for a little way on the large end to allow the screw to clamp it in position after the gage is set to the required size with the micrometer. A. M.

New York.

Indexing Sub Presses.

Editor American Machinist:

Enclosed you will find two index cards showing the system used by the American Arithmometer Company, of St. Louis, and developed by myself as foreman of the press and die department, for keeping



A SLOT GAGE.

SYMBOL NO. 212.-212 N.-212 FR.

STOCK 8 11/16 x 8 3/4 x 1/16 GALLEY BRASS. NUMBER OF OPERATIONS 4.

NO. OF PIECES TO MACHINE,	1	DUPLICATE DIES.	SUB-PRESS.
NO. OF PIECES TO ONE FOOT.	1		
NO. OF PIECES TO ONE POUND,	1.47.		
OPERATIONS.	SUB-PRESS.		
212-1 Round Holes.	L-12		
212-2 Slots.	S-4		
212-3. Perf. for 227.	P-5	OLD OR REPAIR DIES.	
212-4 Perf for 215.	P-5		
212-N-1.	L-11	212-2 old. Slots.	V-C-I.
212-N-2.	S-4	212 N-2	V-C-I.
212-N-3.	P-5		
212-N-4.	P-5		

American Machinist

FIG. 1. INDEX CARD FOR MACHINE PARTS.

SUB-PRESS NO. S-4 STYLE SPECIAL. 212-2 SLOTS. REMARKS.

PRESSES,	P-4		Change stops for 212. 213.
BOLSTERS,	1.		Change studs for 212 N. 213 N.
ECCENTRICS,	2.		Oil punches lightly for 2-4.
PLUNGER-PIN,	ON DIE.		Keep paper cover on work.
DRAWINGS,	H-2	1160	Use Sub-Press V-C-I for Fractional.
PATTERNS,	A-97. A-99.	A-98. A-100.	
OTHER PIECES ON SUB-PRESS.			
213-2			
212-N-2			
213-N-2			

American Machinist

FIG. 2. INDEX CARD FOR SUB-PRESSES.

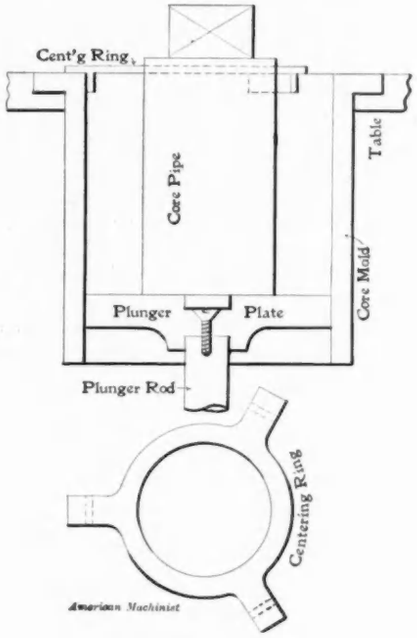
track of dies used in manufacturing the Burroughs adding machine. There are about 400 sub-presses on which are done about 700 operations, covering the machines as now made and also all repair work on all machines that have been made. All pieces have a symbol number, and all sub-presses have a location number. By referring to symbol card No. 212, Fig. 1, it will be seen that there are three pieces of that number—212, 212 narrow and 212 fractional. The operations on the piece are given in their order, and opposite each operation is the location number of the sub-press the work will be done on, and this number is also the key number to the sub-press cards shown in Fig. 2, which will explain itself. Sub-press S4, for example, will be found in section "S," locker 4 of the die rack. Both sub-press and rack have brass plates with the location number on them, and when the sub-press is in place, the numbers will correspond. All dies are sub-pressed.

E. DEAN.

Centering Core Pipes.

Editor American Machinist:

Having been asked several times concerning the manner of setting and centering core pipes in the sand-core stuffing machines in use at Escher, Wyss & Co.'s Krupp's, and other European establishments, I show the process by a simple sketch. The core-mold proper, a vertical cylinder (or sometimes square-sectioned box) has its flange at the upper end temporarily made fast to the table on which the core-sand is piled. The plunger plate fits snugly in the mold, and is attached to the plunger rod by a flush-screw or a sunken screw in the center, being changed to suit the core-mold. The core pipe is simply set on the plunger plate; its lower end being cut off square, the pipe is vertical if the plunger plate is horizontal. To ensure centrality, there is used a centering ring shown in the sketch, this being merely a flat ring with three radial lugs, each of which has on its under side, at equal distance from the center, a downward projection or guide piece, which bears against the inner surface of the core-mold wall. This description of the centering piece applies to that used for a cylindrical core-mold; where the mold is square, elliptical, etc., in cross-section, the centering piece has a different and corresponding orifice, and differently arranged



CENTERING CORE PIPES.

arms and guide pieces. Where there are various sized core pipes used for any one mold, the centering ring for the larger pipes may be bushed for the smaller rings.

ROBERT GRIMSHAW.

Hanover, Germany.

A Proposition, a Problem and a Paradox.

Editor American Machinist:

In commenting on the article, "A proposition, a Problem and a Paradox," by W. A. Warman and R. B. Cochrane, in your issue No. 29, I can say that I admire the mechanical principle of the proposition, and consider the problem well solved by the method adopted to perform the operation, but I cannot admit anything paradoxical in the so-called paradox, when by mathematical reasoning it ceases to be such, and the results obtained are only what would be expected.

It is very evident that in computing the pitch of teeth on the knurling tool, the chordal pitch, or the straight-line distance from the point of one tooth to the point of the next one, on the largest or addendum diameter should be used.

As the angle of the knurl is 61° 15′ and the diameter of the work is 1 1-16 inches, the diameter of the knurl $= 2a \sin \alpha$ (see sketch for notation). Working this out gives .541 inch as the diameter. The

chordal pitch may be found by the formula:

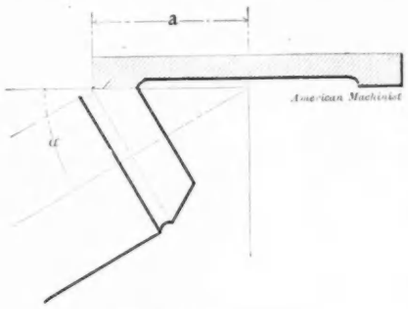
$$P = D \sin. \frac{180°}{N}$$

in which

P = chordal pitch,
D = diameter,
N = number of teeth.

Inserting .541 for D and 60 for N gives $P = .0283$.

It now remains to find the number of teeth of this chordal pitch that will complete a circle of the size of the piece of



NOTATION OF FORMULA.

work. The angle subtended by a tooth may be found by the formula:

$$\frac{P}{D} = \sin. \tfrac{1}{2} \alpha$$

from which we easily find that

$$\alpha = 3.05 \text{ degrees}$$

$$\text{and } \frac{360}{3.05} = 118 \text{ almost exactly,}$$

which is the result obtained in practice. My theory may not be accepted by these gentlemen, but it certainly fits the facts.

F. A. HAZARD.

A Screw Milling Machine.

Editor American Machinist:

I have read with a great deal of interest the article in your issue No. 34, wherein is described an English machine for milling screws.

For threads to which it is adapted I have no doubt that the machine is an admirable one. Whether an absolute novelty in principle or not, it is such as a shop machine, and I doff my hat as gracefully as I know how to its designer. Is not the claim that it will cut square threads, however, a little more than the facts will stand? In fact, is it not mathematically impossible to cut a square thread with a disk milling cutter? It is not necessary to go into the matter deeply, but reference to the illustrations of square threads in the article referred to will show the different angles at which the tops and bottoms of square threads lie with respect to the axis of the work. Whichever angle the machine be set to, it will be wrong for the other, and the cutter will be slewed with respect to the face of the threads. This is a condition which often arises in spiral milling and all who are familiar with that class of work understand the attention that must be given to the shape of the cutter if it is to reproduce its own angle.

With a slight angle to the thread, as in Acme or worm threads, if the diameter of the work is not too small with respect to the size of the threads, this condition will not hold, the angle of the cutter clearing the work in spite of the different angles at the top and bottom of the thread. I have no doubt that this machine will produce such threads at a very economical rate, but I fail to see how it can produce square threads.

I have had something to do with attempts to produce square threads by other processes than the use of a common lathe tool, and in such attempts we run across difficulties at every turn. A little experience will convince anyone that manufacturing processes for producing square threads are a first-class thing to let severely alone, though perhaps I ought to say that the square thread itself is a better thing to let alone. Little can be said in its favor from any point of view. The Acme thread is as good, or better, for most purposes, and far easier to make with satisfaction.

C. O. GRIFFIN.

A Clamp Holder.

Editor American Machinist:

It is the usual practice in filing to a line, on small work, such as dies, templets, etc., to hold the work in an ordinary machinist's clamp, which is in turn held in the vise by the head of one of the screws. The principal objection to this method lies in the fact that it is very often difficult to get the work in the best position with regard to light and convenience of working. To overcome this difficulty I made the clamp shown in the accompanying sketch, which needs very little explanation. As will be seen, one of the jaws is extended and a ball turned on the end, which is held in the socket, shown in end view in Fig. 2. By loosening one of the cap screws the clamp may be swung into any position within its range or turned bottom side up without disturbing the work, and is held very rigidly when screw is tightened. It is also easier to give a die uniform clearance, as the clamp may be tilted to the required angle and the filing done in a true vertical line. "NEEDLE."

Waterbury, Conn.

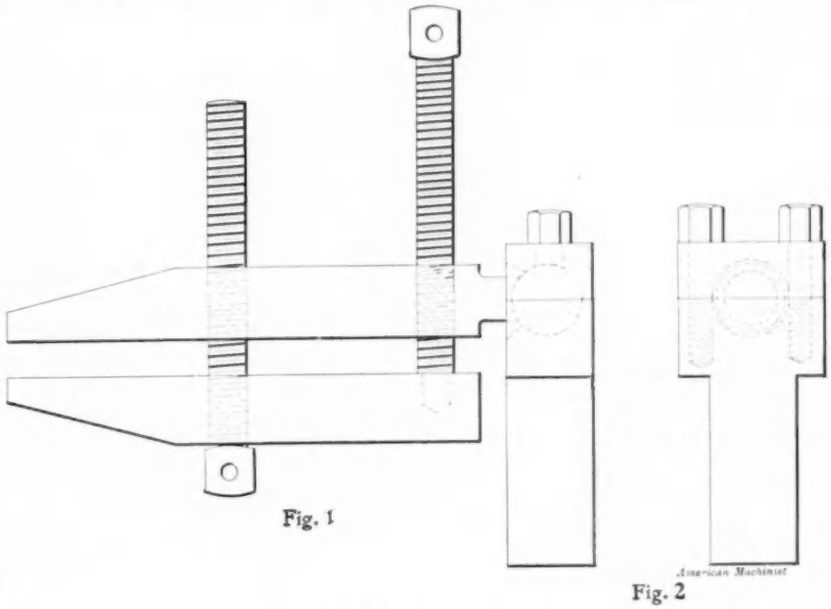


Fig. 1 Fig. 2

A CLAMP HOLDER.

Some New Things.

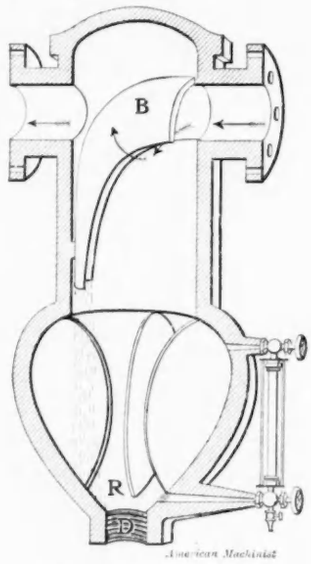
WATCH CHARM MICROMETER.

At page 880 we mentioned a watch charm micrometer, which we stated was the same as the larger micrometers used in machine shops, except that it was on a smaller scale. We find, however, that it

is heavily gold-plated for appearance and to prevent rusting. It measures in thousandths of an inch up to 3-16, and is made also to metric measurements when desired. We are assured that care is taken in its manufacture and that each micrometer is carefully tested and made to measure accurately. They are made by the Sterling Watch Tool Company, Rochester, N. Y.

IMPROVED STEAM SEPARATOR.

A glance at the cut enables one readily to see the principle upon which this separator works. The course of the steam is indicated by the arrows. As it enters the separator it strikes the inner curved surface of the deflector which is like a taper elbow with the inner portion of the bend cut away. The water is instantly



IMPROVED STEAM SEPARATOR.

thrown down to the reservoir at the bottom where it remains and can be drawn or trapped off as it accumulates, while the steam whips sharply back, throwing off any remaining water or oil, and passes out of the separator at the opposite side. The vertical ribs in the lower part are found of value in preventing the disturbance of the water after it is once deposited. Calorimeter tests have shown an efficiency of 99½ per cent. for this separator. It is the Lippincott Steam Separator and Exhaust Oil Extractor, made by the Union Steam Specialty Company, 126 Liberty street, New York city.

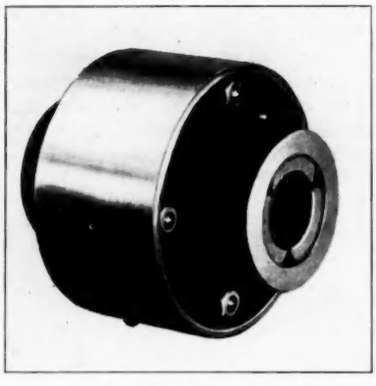


FIG. 1. THE COUPLING ASSEMBLED.

SHAFT COUPLING.

The illustrations show a new shaft coupling of the compression type, which is manufactured by the W. P. Davis Machine Company, of Rochester, N. Y. Fig. 1 shows the coupling assembled and Fig. 2 disassembled. The hub is connected to the rim of the coupling by three arms, which are not radial, but set at an angle which will permit considerable spring. As cast, the hub is in one piece, but after boring and turning it is cut endwise into three pieces, each piece being supported by an arm. The outside of the hub is turned tapering and the holes of the compression flanges are bored tapering. When the flanges are put in place and drawn together by the bolts, the shaft is powerfully gripped and the two ends are obviously brought into alinement.

No keys are used and no special fitting is required, and hence the putting up and taking down of the coupling is obviously a matter of a few moments only.

The American School of Correspondence, of Boston, announces in another column the withdrawal of its free-scholarship offer at a certain date. While it is still open, however, it certainly affords a good opportunity of securing the help of a first-class technical educational organization.

Obituary.

James W. Lyall, who was the inventor of important devices used in the manufacture of cotton cloth and a manufacturer of looms—head of the firm of J. & W. Lyall—died in this city on the 23d inst., aged 68. He was born in Scotland and came to this country when 3 years old.

Personal.

Henry B. Binsse, of the Binsse Machine Company, Newark, N. J., was scheduled to sail for Europe, August 28, in the "Teutonic."

Manufacturers.

The Kansas City (Mo.) Buggy Company has plans drawn for new buildings.

The Winona (Minn.) Wood Rim Company will erect a factory at La Crosse, Wis.

The Toledo Motor Carriage Company is

(*Continued on next page.*)

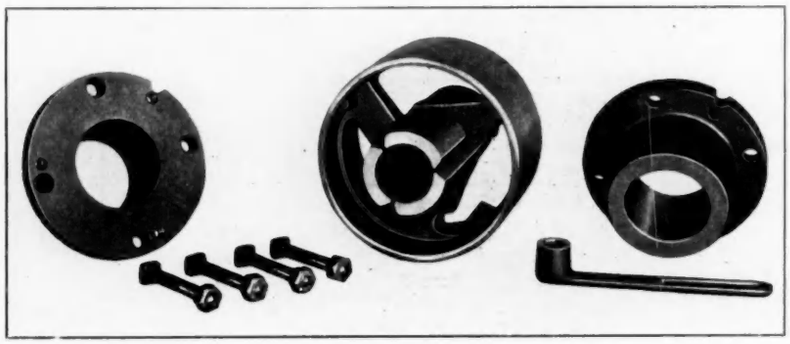


FIG. 2. THE COUPLING DISASSEMBLED.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 20.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Punches & dies. Wal.M.Wks., Waltham, Mass.

Shafting straighteners. J.H.Wells, Tampa, Fla.

W. Y. Schmucker, mfrs.' agent, Reading, Pa.

Wanted—Improvements in grinding machinery. Address Box 1435, Providence, R. I.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas, Bridgeport, Ct. Send for index sheet.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

See 12 presses & dies for sheet-metals, S. E. cor. Machinery Hall, Buffalo Exposition. Ferracute Mch. Co., Bridgeton, N. J.

Wanted—Second-hand gas engine, about 60 horse-power; state name of maker, time used and full particulars. The Enterprise Mfg. Co., Akron, Ohio.

Machinery built by contract; modern equipment and organization; accurate work; prompt delivery; low prices; weights up to 5 tons. The Blanchard Machine Co., Boston.

Gear and Milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

Manufacturers who want to have their goods sold in Vermont and New Hampshire by a personal representative are invited to address "Salesman," P. O. Box 672, New York.

Purchaser for small manufacturing plant; lot, 100x180 feet; machine shop, 32x68, two story, with line shaft and gasoline power; foundry, 40x54, new modern equipment; good location; for sale cheap. Hart-Parr Co., Madison, Wis.

Two hand-colored tempering charts (A and B), 36 steel working receipts and free sample of Monarch Welding Compound, all for $1; these cover all difficult steel working; invaluable to machinists. W. M. Toy, Sidney, Ohio (40 years a steel worker).

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

I have a nicely equipped small machine shop and am looking for paying work on small machinery, motors, clockworks, gear cutting, tools, dies, etc.; models and experimental work carefully executed; discretion guaranteed. S. Messerer, 24 Boudinot st., Newark, N. J.

A representative of an engineering company with modern works in England under American management will be visiting New York on or about September 1, and will be pleased to receive particulars of, and investigate engineering specialties with a view to their manufacture and introduction in Great Britain and the continent of Europe. All communications, which in the first instance must be in writing, to be addressed "Anglo-American Engineering," Holland House, New York.

An old-established firm of London merchants who have an engineering department working important continental agencies which they have held for many years, will be glad to represent responsible American manufacturers of machine tools, narrow-gage locomotives or machinery of any description; they are also prepared to take up agencies for other kinds of American specialties likely to command markets in England and in Europe; references given to business friends in New York to whom the firm is personally known. Write with full particulars to "Alexander" 7, Idol Lane, London, E. C.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of

recommendation or other papers of value should not be enclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman wishes position. Address Box 420, AMERICAN MACHINIST.

Designer of machine tools and jigs, now holding responsible position, desires to change; can show first-class record. Box 399, AM. M.

Situation wanted; 10 years in charge of manufacturing small, accurate work, screws, die work, wheels, pinions, etc. Box 416, A. M.

Mechanical draftsman, graduate, 12 years' experience, blast furnace, steam engine, general machinery, wants position. Box 418, AMERICAN MACHINIST.

A technical and practical man, with all-around experience as foreman and designing draftsman, wants charge of a Western shop. Address Box 411, AMERICAN MACHINIST.

Designing draftsman, young man, technical graduate, experienced in hydraulic, foundry and special machinery, desires to make a change. Address D. D., care AMER. MACH.

Wanted—Position as superintendent or general foreman, by a thoroughly practical mechanic; good executive ability, large experience, good disciplinarian. Box 414, AM. M.

Young man, 13 years assistant manager large factory, desires executive position; clean record; highest character; fine references. "F," 32 Union Trust Building, Indianapolis, Ind.

Mechanical engineer, young, energetic, desires change to position in New York city; valuable connections; German, English and French correspondent; excellent references. S. B., care AMERICAN MACHINIST.

Machinist, toolmaker and designer on engine, electrical, machine tools, instruments, automatic machinery; good systematic and executive ability in handling men and getting out work; A1 references. Box 417, A. M.

We can furnish names and records of competent men for positions as managers, superintendents and foremen in metal-working lines; no charge. Address James Brady, 220 Broadway, New York (formerly of Brady Mfg. Co.).

Wanted—Position as superintendent or assistant, by party with wide experience in modern shops on engines and general heavy machinery; advertiser not looking for snaps, but wishes to be identified with a progressive firm. Box 413, AMERICAN MACHINIST.

Wanted—Engagement by competent draftsman, practical and technical training, 22 years' experience as architectural and mechanical engineer and shop draftsman, now engaged on stone-working machinery; 42 years of age, married. A., Box 421, AM. M.

Practical mechanic, 35, now employed as assistant superintendent of large manufacturing establishment, desires similar position with concern whose works are at least 50 miles from sea coast and on high ground; good reason for change; correspondence solicited. Box 402, AMERICAN MACHINIST.

Mechanical engineer, technical graduate, 10 years' practical experience, 3 years manager of large machine works and steel foundry, invites correspondence with firm requiring man of ability and experience as manager, general superintendent or mechanical engineer. Address Box 412, AMER. MACH.

As superintendent or foreman, by a thoroughly competent young machinist; has had 12 years' practice at engine and dynamo building and 2 years in charge of shops; understands how to handle men and work and can furnish gilt-edge reference. Address "Competent," care AMERICAN MACHINIST.

General superintendent, energetic American, who understands his business from A to Z, would appreciate a position where there is something to do; prefers work to snaps; can organize a machine plant so as to minimize cost and give a reason why. Parties requiring an up-to-date man with plenty of push, practical experience and technical education, will find him at Box 401, AMER. MACHINIST.

Help Wanted.

Wanted—One good, first-class machinist. Jenkins & Lingle, Bellefonte, Pa.

Wanted—First-class machinists. U. S. Long Distance Automobile Co., 307 Whiton st., Jersey City, N. J.

Wanted—Machinists; two floor hands, one good boring and turning mill man. Address Northern Engineering Works, Detroit, Mich.

Wanted—First-class draftsman, accustomed to gun and bicycle tools and fixtures; also a good detailer. Address "Q," care A. M.

Wanted—Two or three good draftsmen; those familiar with engine and dynamo work preferred. Address Ridgway Dynamo & Engine Co., Ridgway, Pa.

Wanted—First-class machinist with experience in operating machines for corrugating flour mill rolls. Great Western Mfg. Co., Leavenworth, Kansas.

Wanted—A piece-work clerk for electrical factory. Apply, stating wages and experience, to Canadian General Electric Co., Peterboro, Ontario, Canada.

Machinists wanted at San Francisco; wages $3.50 per day; bonus of 50c. additional per day for one year of satisfactory service. Box 370, AMERICAN MACHINIST.

Good patternmakers, both wood and metal, desiring steady employment, will find it to their advantage to apply to the General Electric Co., Schenectady, N. Y.

We invite applications from machinists and molders; give references, experience and wages expected; work on air compressors. Franklin Air Compressor Co., Franklin, Pa.

First-class diemaker for small manufacturing plant in large Eastern city; good wages; steady work for the right man; state age and experience. Address Brass Co., care AM. M.

A large New York factory requires the services of a few mechanical draftsmen for intricate work; state age, experience and salary; permanent positions. Box 381, AM. M.

Wanted—For out-of-town position, a thoroughly competent mechanical draftsman; state experience fully and salary required, together with references. Box 394, AM. MACH.

Wanted—Working foreman for turret department, to take charge of ten turret and screw machines; state experience, wages expected and references. The Bickford Drill & Tool Co., Cincinnati, Ohio.

Wanted—A first-class draftsman with experience on high-grade engine work; give particulars of experience, salary expected, references and state how soon could come. Box 405, AMERICAN MACHINIST.

Wanted—Draftsmen experienced in structural and mechanical work; good salaries and permanent position to the right men; give record, stating experience and salary expected. Box 347, AMERICAN MACHINIST.

Foreman for New York factory, experienced in the manufacture of parts as used in small clocks and watches; must be familiar with modern machines. Address, stating age, experience and salary, Box 419, AMER. MACH.

Man who thoroughly understands brass polishing and nickel plating wanted to take charge of a small plant in the country near New York. Address, giving wages expected, references and experience, Box 396, AM. M.

Wanted—First-class fitter and assembler on machine tools, as working foreman, to take charge of work in growing Western shop; large city; good opportunity for up-to-date man. Address Box 408, AMER. MACH.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—An experienced manager and mechanical engineer accustomed to up-to-date methods for producing small and medium machine work of best quality and cheaply; salary and best of references required. Address Box 346, AMERICAN MACHINIST.

Wanted—A mechanical draftsman with experience on machine tool work or special heavy machinery; position permanent; must come well recommended; a young man preferred; state age, salary expected and references. Box 409, AMERICAN MACHINIST.

Wanted—Two mechanical draftsmen, experienced in light automatic machinery; only first-class men need apply. Address letter, stating full particulars, references and compensation wanted, to the American Tobacco Co., Construction Dept., 529 West 22d st., New York.

Draftsman wanted; must have general knowledge of shop methods and be capable of designing light machinery, under instruction; a permanent position is open for the right man, in a small shop running on high-grade specialties. Address, giving full particulars, Box 393, AMERICAN MACHINIST.

Wanted—A foreman for pattern shop in architectural iron works, capable of handling 10 to 15 men; must be thoroughly familiar with all kinds of iron stair work and ornamental iron work and in buildings; position permanent to the right man. Address Jas. McKinney & Son, Albany, N. Y.

Wanted—Machine shop foreman, between 30 and 45 years of age, able to produce work at the lowest cost; one acquainted with printing machinery preferred; please give references, experience, age and pay expected; right reserved to reply only to such as are thought suitable. "Revod," care AM. MACH.

Wanted—Competent salesman in gas and gasoline engine and steam pump lines; must be energetic; resourceful and of good charac-

(Continued on next page.)

(Continued from preceding page.)

having plans prepared for an automobile livery.

An open hearth steel plant will be added to the plant of the Tidewater Steel Company, Chester, Pa.

Fire has destroyed the main building of the Washington Milling Company's plant, at Adrian, Mich.

The Greylock mills, cotton goods, Adams, Mass., are to build an addition. New combers are to be added.

The St. Louis Steam Forge & Iron Works will erect a new building at the foot of Barry street, St. Louis, Mo.

Herpel Brothers, Reynoldsville, Pa., are in the market for a complete line of machinery for making red brick.

The John Cudahy Company will in a short time double the capacity of its packing house in Wichita, Kan.

The Des Moines (Ia.) Scale & Manufacturing Company will erect a new building, 60x132 feet, three stories.

Contracts have been let for works for the Columbia Enameling & Stamp Company to be built at Terre Haute, Ind.

The Forrester Plaster Company, of Cleveland, O., is sinking shafts near Port Clinton and may erect a plant there.

An addition is being made to the factory of the Wallace Barnes Company, Bristol, Conn., manufacturer of clock springs.

The MacGregor Foundry Company, Elmira, N. Y., is looking for a site in Pottstown, Pa., on which to erect a new plant.

The Cincinnati (O.) Coffin Company is about to make an addition to its factory at Richmond and Fillmore streets.

J. S. Fray & Co., manufacturers of bits, braces and hardware, Bridgeport, Conn., will build a brick addition to factory.

The saw and planing mills at Carrier, Pa., owned by R. L. Buzzard & Co., of Brockwayville, have been destroyed by fire.

The contract to rebuild the Maryland Silk Mill, in Hagerstown, Md., of the Collinge & Noman Company, has been awarded.

The Petersburg Iron Works Company, Petersburg, Va., is in the market for a planer and shaper; second-hand preferred.

A power-house is to be erected in Gibbsboro, N. J., for John Lucas & Co., Philadelphia, manufacturers of colors and white lead.

The Madison Spinning Mill Company, at Huntsville, Ala., has commenced work on its new buildings. This is to be a $100,000 cotton mill.

The American Steel & Foundry Company, St. Louis, Mo., is working on the foundation of the new mills at its plant in Granite City, Ill.

Foundations have been completed for a new foundry addition to the Prizer-Painter Stove & Heater Works, of Reading, Pa., at Mt. Penn.

The Bair & Gazzam Manufacturing Company, machinists, Pittsburgh, Pa., has increased its capital stock from $50,000 to $100,000.

The plant of the American Die & Tool Company, which was recently removed from Wilmington, Del., to Reading, Pa., is ready for operations.

The Lobdell Car Wheel Company, Wilmington, Del., will probably blow in the White Rock Furnace, in Smyth County, Va., in a short time.

Plans are preparing for a mill building to be erected in Frankford, Philadelphia, for the Wingohocking Mills Company, common yarns, ropes and twines.

Fire in the Illinois Central shops at

Paducah, Ky., has burned the planing mills, coach shop, paint shop and pattern shop. They will be rebuilt.

In the big fire at the Atlantic Refining Company's plant, Point Breeze, Philadelphia, a quantity of pumping machinery was wrecked, among other things.

The Damascus Bronze Company, Allegheny, Pa., is adding to its buildings and installing new machinery which will give an increase of about 40 per cent. in capacity.

Work has been started on the foundation for a new building for the Charles Parker Company, Meriden, Conn., manufacturers of hardware, lamps and piano stools.

A Chicago building permit has been granted the McCormick Harvesting Machine Company for a five-story brick factory on Leavitt and River streets, to cost $36,000.

Fire has destroyed the plant of the Alabastine Company, Grand Rapids, Mich., but it is not believed that the loss on the machinery, boilers and engines will be total.

The directors of the Lamb Wire Fence Company, of Adrian, Mich., contemplate erecting a steel wire plant in that city. They have voted to double the company's capital stock.

Agreements are said to have been made with the Fort Worth Stock Yards Company by which both Armour & Co. and Swift & Co., of Chicago, will build packing plants in Fort Worth, Tex.

The Chicago Great Western contemplates the installation of electric motive power for all its suburban service out of St. Paul, Minn., reaching as far south as Randolph, a distance of 30 miles.

The J. I. Case Threshing Machine Company, Racine, Wis., has acquired several acres of land near the factory, on which will be erected office buildings, stock and shipping rooms and boiler shops.

Work has been commenced on the erection of an addition to the plant of the Frederick Brass Works, West Pittston, Pa. The new structure will be used for general machine shop purposes and foundry.

Bay City, Mich., news is to the effect that the Hecla Cement Company is about to build a plant. M. M. Green, a director of the company, will be one of the engineers, and he will look after the letting of contracts.

The silk mills, at Petersburg, Va., of Jno. N. Stearns & Co., New York City, will be removed to Williamsport, Pa. The company has given out contracts for the erection of buildings at Williamsport to cost $98,000.

The Wisconsin Condensed Milk Company, Burlington, Wis., has let the contract for an addition to its factory and will put in the machinery to make their own cans. The improvements will amount to about $40,000.

The Eclipse Manufacturing Company, Pittsburgh, Pa., has practically completed its new plant and is now ready for the trade. The new works are fitted up with the latest type of machinery for making forgings, rivets, etc.

Joseph Heppert, whose wood-working establishment and lumber yard, on West Clay street, Richmond, Va., was destroyed by two fires, has decided to rebuild at least a portion of his plant, and probably all of it eventually.

W. K. Du Pont, Johnstown, Pa., states that the proposed tin plate plant will be located at Ferndale or Meadowville, near Johnstown. The new works will have a capacity of 14,000 boxes a month. Machinery has been ordered.

The erection of a large five-story brick factory building for renting purposes will

(*Continued on next page.*)

Help Wanted—Continued.

ter and habits; give full information in regard to previous employment and salary expected; permanent position, with good opportunities, for the right man. Box 410, AM. M.

Wanted—By large, indepedent steam pump manufacturers in the middle West, mechanical engineer experienced in steam pump designing; must be energetic and of undoubted ability; permanent position and good opportunity for the right man; give full particulars as to experience, references and salary expected. Box 406, AMERICAN MACHINIST.

Wanted—Machine shop foreman for shop building a general line of wood working machinery, working 60 men; must be strictly temperate, up to date and capable of working men and tools to best advantage; one accustomed to getting out work rapidly and in good shape; give full particulars as to what you have been doing, also references, age and salary wanted. Address "Superintendent," Box 305, Atlanta, Ga.

Wanted—An experienced draftsman, designer and foreman, to take an interest and position in a machine shop in a thriving Western city of 300,000 population; business well established, doing a general repair and jobbing business in boilers, engines, pumps, new and second hand; dealers in pipe, valves, fittings and engineers' supplies, and steam heating, contracting and the erection of power plants; party can invest $5,000 and upwards. Address Box 374, AMERICAN MACHINIST, giving references and particulars.

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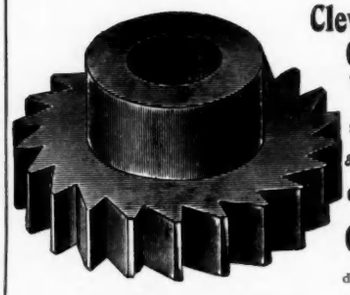
No registration fee.

THE ENGINEERING AGENCY,
1605 Monadnock Block, CHICAGO

WANTED

Sales Manager to take charge of correspondence with customers and salesmen; experience with hardware and machinery trades desired. Address Box 415, American Machinist, giving references.



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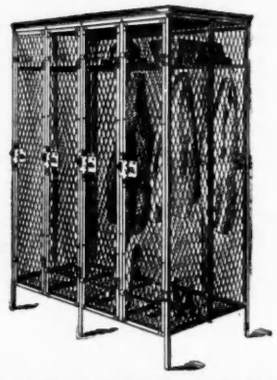

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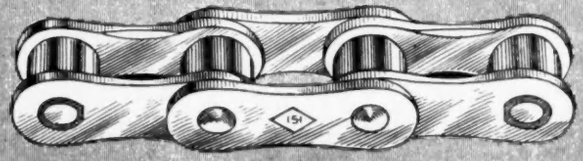

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